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Home Comforts: the Role of Hormones, Territoriality and Perceptions on the Home Advantage in Football

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the degree of Doctor of Philosophy

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ABSTRACT

Since the seminal work of Schwartz and Barsky (1977) detailing the notion of a home advantage, whereby teams perform consistently better at home opposed to away, there has been a plethora of research dedicated to studying this phenomenon. Many explanations for the home advantage have been proposed, including crowd support, venue familiarity, travel, rules, referee bias, and more recently, the territorial and behavioural responses elicited by a home venue. Neave and Wolfson (2003) reported that testosterone levels in male football players increased significantly at home compared to away, with defenders' levels higher than midfielders and forwards. Ice hockey players' pre-game cortisol levels have also been shown to be significantly higher at home (Carré, Muir, Belanger & Putnam, 2006). This thesis has attempted to provide a clearer understanding of the home advantage in football through both hormonal and perceptual perspectives.

Study 1 examined elite male academy players' testosterone and cortisol levels both before and after competitive games. Results replicated positional effects for testosterone whereby defenders had significantly higher levels than midfielders and forwards, but there were no venue, time or rivalry effects. Post-game cortisol increases at home were also found, with no rivalry or positional effects. Study 2 investigated testosterone and cortisol responses to venue in a male Blue Square North football team, with samples taken both before and after two home and two away games against a moderate and major rival. A marginally significant interaction revealed a trend for higher post-game testosterone levels for defenders; however, there were no main venue or time. Post-game cortisol increases were also found, as well as an interaction with higher post-game cortisol levels at home. Using a different cohort of male elite academy players Study 3 found post-game testosterone levels were significantly higher than pre-game levels, with a marginal non-significant trend for higher levels at home and, again, no positional or rivalry differences. In addition, cortisol results also revealed a main effect for time with post-game levels significantly higher than pre-game levels obtained. There were also no venue, rivalry or positional differences.

To shed further light on these and other venue effects, Study 4 adopted a qualitative approach combining deductive and inductive thematic analysis to explore perceptions of the home advantage from professional players and managers. The factors outlined in Pollard and Pollard's (2005) home advantage model were supported, and the current study unearthed two additional higher-order factors of control and experience which alongside psychological factors appear to impact upon the home advantage. Study 5 sought to explore county and elite referees' perceptions of their role in the home advantage. The results revealed an overall superiority effect for both referee groups, although only county referees indicated that they were far less influenced by external factors than their fellow county league referees. Lastly, Study 6 adopted a multi-perceptual approach and found similarities in the perceptions of fans and players compared to the referees on items which implicated officials in the home advantage. The programme of work in this thesis highlights the complexity of the home advantage. The experiments investigating the effects of testosterone and cortisol highlight the importance of the role of hormone-mediated territorial responses associated with venue, and the studies of perceptions support and add to the potentially wide range of additional factors associated with the home advantage.

Key words: football, home advantage, territoriality, testosterone, cortisol.

DEDICATION

I dedicate this thesis to a very special Nana

22nd May 1929 – 14th March 2006

Gone but never forgotten

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LIST OF ABBREVIATIONS

ACTH	Adrenocorticotrophic Hormone
AVP	Arginine Vasopressin
CRH	Corticotrophin-Releasing-Hormone
CSAI-2	Competitive State Anxiety Inventory 2
FA	Football Association
FIFA	Fédération Internationale de Football Association
FSH	Follicle-Stimulating Hormone
GnRH	Gonadotropin-Releasing Hormone
HPA Axis	Hypothalamic-Pituitary-Adrenal Axis
HPG Axis	Hypothalamic-Pituitary-Gonadal Axis
LH	Luteinising Hormone
NHL	National Hockey League
PGMOL	Professional Game Match Officials Ltd.
POMS	Profile of Mood States
PVN	Paraventricular Nuclei
STAI	State-Trait Anxiety Inventory
TSST	Trier Social Stress Test
UEFA	Union of European Football Associations

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AUTHOR DECLARATION

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work.

Name:

Signature:

Date:

Chapter 1

Home Advantage: An Introduction

“Home advantage gives you an advantage”

Sir Bobby Robson

1933-2009

Chapter 1: Home Advantage: An Introduction

1.1 Football as an Institution

Association football (to be referred to as football throughout this thesis) is considered as one of the most popular sports throughout the world. Football is known to encompass all ages, genders and socioeconomic backgrounds in some capacity whether it is through playing, watching or officiating. Football is regarded as one of the world's most popular sports and according to the Fédération Internationale de Football Association (FIFA) (2006) around 265 million players, male and female are actively involved in the game. With the addition of referees and officials the number rises to around 270 million resulting in approximately 4% or 1 in 25 people of the world's population that are involved in football. In the United Kingdom (UK), the Football Association (FA) has estimated that approximately 7 million people play a form of the game, including 3.9 million children. The FA also state that there are over 1,700 leagues and around 125,000 FA-affiliated teams that play within these leagues (<http://www.thefa.com/TheFA/WhatWeDo.aspx>). Football also encompasses a large demographic, according to the European Football Labour Market Review (The Professional Football Players Observatory, 2009) the average age of players in top European leagues is 26.1 years with around 22% of European players being home-grown. Furthermore, the percentage of foreign players has reached a new record of 42.6% of players contesting matches in a different country to their birthplace, with England employing the highest proportion at 59.2%. The mobility of players has also risen with players on average changing clubs 3.47 times every ten seasons. These statistics highlight the popularity of the game not just in the UK but also from a more global standpoint with the UK game attracting players from a variety of other countries.

Football has become renowned for the amount of money that is associated with it, with the attraction of billionaire owners, large transfer fees and multi-billion pound revenue generated from tickets, corporate events and merchandising. This influx of investment into the game has resulted in greater expectations from owners, resulting in increased pressures on players and managers to perform. According to Deloitte's (2009) Annual Review of Football Finance the

total European football market grew by around €1 billion to €14.6 billion in the 2007-2008 season. The English Premier League was the highest revenue-generating league in the world where clubs generated €2.4 billion in 2007-2008. Total wage costs for the five biggest leagues in Europe were €4.8 billion, and Premier League wage costs increased by 23% to €1.5 billion. Total Premier League revenue increased by 402 million in 2007-2008 to 1,932 million an increase of 26% with the top 92 clubs generating overall revenues of 2,458 million an increase of 21%. The report has also detailed the impact of revenue generation via broadcasting revenue with member clubs receiving £767 million. Match day revenue also increased by a small amount to 3% in the 2007-2008 season to £554 million, the relatively small amount was attributed to a ticket price freeze.

With the vast riches that are at stake within the competitive game a growing importance is evident for the owners, players and managers involved within a club to understand the physiological and psychological mechanisms that can help teams gain a competitive edge. In the 2008-2009 season one of the biggest football clubs in the Premier League was relegated, this being Newcastle United Football Club; they had a millionaire owner, millions of pounds worth of players, a stadium which regularly filled its 52,387 capacity, had spent 16 years in the Premier League and yet were not immune to being relegated. There are countless other examples in football with once successful teams not performing to their potential including Leeds United and Nottingham Forest, teams which have succeeded in the past and have a long associated history but are currently playing in divisions to which they are not accustomed.

The aforementioned factors outline the increased pressures to which football teams and the managers and players within them are currently exposed. One way to maximise a team's potential in their league is to enhance their own home advantage. It has been widely known throughout sport that teams and individuals are known to perform better at home than they do away. Understanding the mechanisms behind this advantage and exploring the differences between home and away performance can provide valuable information to the agencies involved.

1.1.2 The Home Advantage: A Beginning

The home advantage is a term recognised worldwide by pundits, commentators, players, athletes and managers in virtually all team sports including ice hockey, basketball and football (Courneya & Carron, 1992; Nevill & Holder, 1999). The first pioneers to attempt to understand the home advantage were Schwartz and Barsky (1977) who demonstrated that teams performed better at home as opposed to away. The authors provided convincing statistics and an initial explanation of the mechanisms of the home advantage, identifying key concepts such as familiarity and audience size. Content analyses of media reports have also revealed more citations referring to the difficulty in defeating an opponent at their home ground than any other contributing factor (Edwards & Archambault, 1989).

In the next phase of research, Courneya and Carron (1992) defined the home advantage as “the consistent finding that home teams in sports competitions win over 50% of the games played under a balanced home and away schedule” (p.13). This is a notion that has been repeatedly tested, with many researchers acknowledging a higher win percentage at home. Some examples include 64% winning average in soccer (Pollard, 1986) 54% average in baseball, and 53% average in hockey (Schwartz & Barsky, 1977). Agnew and Carron (1994) also found that a home advantage existed in junior ice hockey over two seasons with 86.7% of teams having a better home record. The home advantage has also been studied in the UEFA Champions League football with data stemming across six seasons; home teams won 67.7% of matches with the home team nearly two times more likely to score than the away side (Poulter, 2009). A review of the past three seasons in the English League statistics also provides evidence for the home advantage and can be illustrated via Table 1, showing more average home wins than away and on average more home goals scored at every level.

Table 1.1 Home advantage statistics, English football leagues, 2006-2007, 2007-2008, 2008-2009 seasons (data retrieved from: <http://stats.football365.com/>)

Division (N teams)	Average home wins	Average away wins	Average home goals	Average away goals
Season 2006/2007				
Premiership (20)	47.89%	26.31%	27.60	18.95
Championship (24)	48.17%	29.52%	34.45	25.50
League 1 (24)	45.08%	29.70%	31.95	25.79
League 2 (24)	44.74%	29.52%	32.25	25.00
Conference (24) (*renamed the Blue Square Premier)	43.48%	32.22%	32.20	26.62
Season 2007/2008				
Premiership (20)	46.32%	28.95%	29.05	19.85
Championship (24)	42.39%	26.61%	32.91	25.16
League 1 (24)	46.52%	28.04%	31.79	23.83
League 2 (24)	39.13%	37.65%	31.04	28.41
Blue Square Premier (24)	43.65%	30.78%	35.20	29.87
Season 2008/2009				
Premiership (20)	45.52%	28.85%	26.60	20.50
Championship (24)	43.30%	27.35%	31.96	24.29
League 1 (24)	42.74%	32.43%	34.91	28.25
League 2 (24)	41.30%	29.0%	32.33	24.92
Blue Square Premier (24)	46.0%	28.26%	30.04	25.71

1.1.3 Home Advantage: The Exceptions

There are some exceptions to the home advantage where the advantage gained at home has not been as strong as has been suggested or notable differences exist between different countries. Nevill, Holder, Bardsley, Calvert and Jones (1997) investigated the home advantage in international tennis and golf tournaments. The results showed very little evidence in favour of

a home advantage for both sports and there were only a couple of viable home advantage instances; namely the Wimbledon tennis tournament and the US open golf championship where the lower ranking home competitors had a greater opportunity to perform above their current rankings. The lowest recorded home advantage figure of 50.5% was in the sixth round of the Football Association (FA) cup which is the last round in which a home advantage could be prevalent, whereas the highest recorded figure was in the European Cup semi-finals played over two legs with a home figure of 78.5% compared to 73.6% away (Pollard, 1986).

In 1981, the number of points awarded for a win in football increased from two points to three, a change that was replicated throughout the world. This point change was initiated to encourage positive play in both teams. The change has been associated with a greater home advantage than if two points were awarded. However, Pollard and Pollard (2005a) have reported that a decline in home advantage has existed since the change in 1981. A study looking at long term sporting trends found that the highest levels of home advantage in football were in the early years of the sport's existence; these levels have been found to decline over the last two decades, and the authors acknowledge that these declines could be due to technological advances in travel (Pollard & Pollard, 2005b). A recent study has explored the second leg home advantage in European football cup competitions which can be explained as the advantage that a team gains when they play their second leg of a two-leg competition at home. Page and Page (2007) reported that a significant home advantage effect was found for all three European football competitions, where the team who plays second has more than a 50% chance of qualifying for the next round of the competition. However, the authors are in agreement with Pollard and Pollard (2005a) and have also noted that the home advantage has decreased significantly over the past decade. With reference to this decline in the home advantage it should be noted that this has not been demonstrated in every sport and despite this suggested decline, the evidence that teams perform better at home largely remains statistically prominent.

Pollard (2006) examined worldwide regional variations in home advantage and found that European home advantage statistics were higher than average in Balkan countries such as Albania and Bosnia. Furthermore, it was found that in South America home advantage was

higher in the Andean countries and lower elsewhere, most notably Uruguay. In addition, these worldwide regional variations could consequently impact upon Cup competitions such as the European Cup and World Cup. However, it has been noted by Pollard (2008) that FIFA use world football rankings to seed teams in World Cup qualifiers, yet they ignore the home advantage when calculating these rankings.

1.1.4 Home Advantage: New Directions

More recently, the notion of a territorial and hormonal response in relation to venue has emerged as a contributor to the home advantage. It has been widely acknowledged in literature pertaining to the animal kingdom that animals are known to respond more aggressively when defending an invasion of their home territory. This territorial invasion has been known to result in an increased physiological response which can be evidenced with increased testosterone and cortisol levels. More recently, this hormonal response has been applied toward humans as an additional explanation of the home advantage; hormones have been shown to be significantly higher at home as opposed to away (Carré Muir, Belanger & Putnam, 2006; Neave & Wolfson, 2003). This territorial and hormonal response provides an interesting avenue for further study as this area of research is relatively new and the evidence uncovered requires further clarification and investigation.

1.2 Purpose of the Study

In light of the above, the purpose of this thesis is to examine the home advantage firstly from a hormonal perspective and secondly from a perceptual perspective. A plethora of research stemming across three decades has been dedicated to studying the home advantage with two decades specifically pertaining to studying the home advantage in football. Despite this, Pollard (2008) has stated that the causes of the home advantage and identified factors that are known to impact upon it are not well understood. Examining the home advantage from a hormonal perspective can provide a greater insight not only to build upon but also to extend previous findings regarding territorial and hormonal findings. Neave and Wolfson (2003) have provided

initial insights in the home advantage and how venue can impact upon players' testosterone responses with higher levels observed at home. In addition, the stress hormone cortisol will also be included for study as this has been reported by Carré, et al. (2006) to also be affected by venue. Research on perceptions of the home advantage has been sparse, and studies which have focussed on this area have only provided a tentative insight into the perceptual mechanisms. In addition, only one study focussing on the home advantage in football has examined perceptions. Understanding the perceptions of various individuals within football could lead to a more holistic view which is needed to uncover additional explanations.

In conclusion the purpose of the present series of studies is to develop a greater understanding of the home advantage in football from a hormonal and perceptual perspective. Specifically this thesis investigates: 1) The impact of testosterone and cortisol on home and away venues; 2) the beliefs held by players, managers and referees regarding the home advantage in football; 3) a review of the existent home advantage models and developing a new model.

1.3 Structure of the Thesis

This thesis comprises ten chapters which subsequently includes six studies. In addition, there is an overall literature review which outlines the home advantage and the individual factors associated with it. The role of the hormones, specifically testosterone and cortisol are also discussed in the literature review with particular attention to their production, general endocrine effects and further effects on exercise and competition. Each chapter of experiments provide a further separate review of relevant literature which is pertinent to the specific study being undertaken. The thesis outline is as follows:

Chapter 2 comprises the overall literature review providing a critical review of research that has been conducted on the home advantage. The general causes such as crowd, familiarity, travel, rules and referees are discussed as well as additional explanations such as tactics, psychological

factors, team quality and territoriality. Additionally, the literature review will also focus upon the role of testosterone and cortisol: how they are produced and their effects on the home advantage, competition and general exercise. The literature contained within this chapter will serve as a basis for the experimental chapters.

Chapter 3 comprises the first hormone study, and it focuses on a professional male under-18 academy team. Testosterone and cortisol levels were obtained pre-game and post-game at three home and three away games. Positional and rivalry effects are studied in addition to player ratings obtained from the coach. The purpose of the chapter is to determine venue effects on hormones in order to extend previous research findings.

Chapter 4 is the second hormone study and focuses upon a male Northern League Football team which comprises older players. The purpose of this study is to extend the findings of the previous experimental chapter with the addition of a controlled baseline training measure. Players in this study also completed pre-match stress and mood measures.

Chapter 5 is the last hormone study and aims to replicate and extend the findings obtained in the previous chapters. Players are recruited from an elite male Under 18 academy team, and testosterone and cortisol samples were obtained before and after training and before and after games on six occasions where opposition comprised minor, moderate and major rivals. Playing positions and coach rating analyses are also conducted.

Chapter 6 focuses on a qualitative investigation exploring the perceptions of football players and managers and their views on the underlying factors of the home advantage. The semi-structured interviews that are conducted are designed to yield a greater insight into previously identified factors outlined in Pollard and Pollard's (2005b) home advantage conceptualisation. It is further envisaged that players and managers may provide additional explanations of the home advantage.

Chapter 7 examines referees' perceptions of the home advantage and is a questionnaire based study. This chapter is designed to contrast county and elite referees' perceptions of the home advantage. This study also discusses referees' perceptions of their own role in the home advantage and also the additional explanations that have been previously identified.

Chapter 8 approaches the home advantage from a multi-perceptual perspective encompassing players, referees and fans. The purpose of the study is to examine any perceptual differences between groups and generate a holistic view of the home advantage.

Chapter 9 summarises the overall findings of experimental studies contained within the thesis culminating in a general overview in light of previous literature. Finally, this chapter considers the implications of the experimental studies and the contribution of knowledge to the home advantage literature and the directions for future research.

Chapter 10 focuses on the theoretical models pertaining to the home advantage and their limitations. This chapter also outlines a proposed new model pertaining to the home advantage in football.

1.4 Overview of Thesis Aims

On achievement of these aims it is hoped that the data collected will contribute to the growing evidence base of the home advantage from a perceptual and hormonal standpoint. The utilisation of a mixed methodological approach may also provide valuable insight into how the home advantage can be studied, and the deep rooted causal factors could uncover any additional factors that have not previously been found. Previous literature namely from Pollard (2008) has identified a dearth of literature surrounding the psychological state of players and their perceptions of the home advantage. The author has further reiterated that ultimately it is of

interest to understand the beliefs of players, managers and referees in order to gain a true representation of the home advantage. This thesis aims to address these issues and enhance the understanding of the home advantage through the generation of players', managers' and referees' perceptions of venues.

Chapter 2

Hormones and the Home Advantage:

A Literature Review

“If you can't stand the heat in the dressing-room, get out of the kitchen!”

Terry Venables

Chapter 2: Hormones and the Home Advantage: A Literature Review

2.1 Overview

This chapter addresses the issues of home advantage and hormones from a two-fold perspective. The initial part of this literature review pertains to the home advantage in relation to the models and factors that have been developed by researchers thus far. An outline of game location research will be reported with a focus on Courneya and Carron's (1992) Game Location Framework. Individual and traditional explanations for the home advantage will be subsequently reviewed to encompass popular explanations such as crowd, familiarity, travel and rule factors. Additionally, there will also be a focus on factors which are related to the popular explanations such as referee bias, ethnicity, mood, home choke and territoriality. Following this review of home advantage literature the next section will introduce the concept of a hormone mediated territorial response. The review will firstly focus upon animal literature and will subsequently introduce literature specifically pertaining to human territorial behaviours. An overview of territoriality will be presented in addition to the identification of pertinent models. Specific attention will then be directed at the hormones testosterone and cortisol: how they are produced and their effects on the home advantage in competitive sport and exercise in general.

2.1.1 Game Location Research: Understanding the Mechanisms behind the Home Advantage

Courneya and Carron (1992) in their comprehensive home advantage review proposed a framework for game location research (see Figure 2.1); this outlined the major theoretical interpretations that have been considered as instrumental in determining the home advantage phenomenon. Game location refers to the playing venue which is either home or away. Neutral venues can also exist; for example in the Football League Cup and Football Association Cup the semi-finals and finals are played at Wembley, the English national stadium of football. A general overview of the factors comprising Courneya and Carron's (1992) Game Location Framework

will be outlined with a review of the main individual components. The review will draw upon subsequent literature pertaining to the specific components which have preceded and informed the framework whilst also reviewing literature which has emerged as a result of the framework.

2.1.2 The Game Location Framework: An Overview

Game location factors consist of four well known factors which have emerged from previous research, they have also been deemed to account for the most variance in the home advantage. The four factors are crowd, learning or familiarity, travel and rule factors. As a result of their review Courneya and Carron (1992) concluded that considerable research into the mechanisms behind the home advantage was necessary, focussing on the when and why questions rather than the what. This is a sentiment that was later echoed by Pollard (2006) who stated that causes of the home advantage still remained unclear.

Critical psychological states refer to the groups of individuals that can be affected by emotion, anxiety, self-presentation and outcome expectations which can result as a consequence of a competitive encounter. The critical behavioural states extend upon critical psychological states and apply to the same collective groups; it can include effort expenditure, aggression, tactics and subjective decisions. The last step within the model, performance outcomes, occurs within three distinct stages: primary, which reflects skill execution and includes variables such as batting average and penalties; secondary, which represents intermediate factors reflecting factors to win a game such as points scored; and lastly tertiary, which outlines the traditional outcome measures for the final competitive outcomes, such as win or lose and points differences.

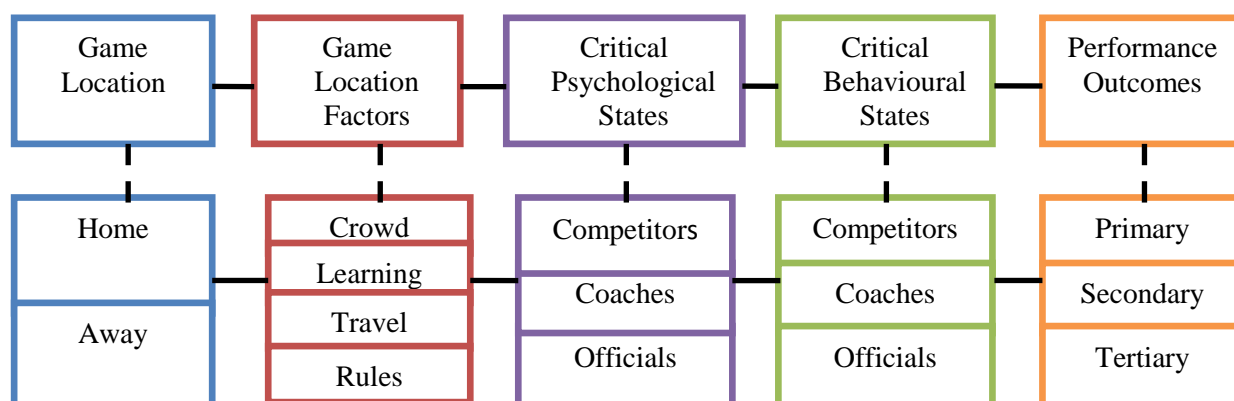


Figure 2.1 Game Location Framework (Courneya & Carron, 1992 p 14)

2.1.3 Crowd Factors

The impact of the crowd on the home advantage has received considerable research attention with specific focus on crowd size, density and the crowd's ability to collectively influence the game. Schwartz and Barsky (1977) examined audience size in their preliminary research and postulated that an audience might have to achieve a certain volume in order to create an impact. Baseball game data were examined and the authors reported that games won by the home team increased from 48% when attendance was low compared to 55% when it was medium and 57% when it was high; a similar pattern regarding home team runs also occurred. In support, Agnew and Carron (1994) aimed to determine whether a home advantage existed in junior league ice hockey with a focus on crowd contribution, crowd density, crowd size and team rivalry. The authors stated that only crowd density was significantly related to game outcome, which they suggested may have enhanced psychological support. The effect of crowd booing has also been studied in college basketball; investigators observed crowd behaviour following scoring, turnover, fouls and composite performance which were then compared with post-booing periods. As a result of crowd protest, the home team performance increased slightly which as a consequence resulted in a more significant decline in the visiting team's performance; the decline was related to fouls committed and composite performance (Greer, 1983). In addition, Wolfson, Wakelin and Lewis (2005) found that many football fans felt responsible for inspiring

their team to victory, took credit for distracting opponents, and believed that they could influence officials into making decisions in their team's favour. The authors also concluded that mechanisms such as the perception of being superior to rivals can encourage fans to retain their allegiance to their teams which can be embedded into their self-identity. It has been stated that the crowd can intimidate opposing team players and reinforce good play in home players (Pollard, 1986). It is also known that stadium design can influence home team performance, via encompassing and heightening the noise of the crowd. Zeller and Jurkovic (1989) found that American football teams who played under domed stadia showed inflated home advantage statistics. This has been partially supported by the findings of Asker (1997) who reported that teams who played in domed stadiums averaged 3.22 points at home whilst open stadiums averaged 3.01 points also in American football.

The hormonal response associated with watching one's team has also been studied. In basketball, fans saliva samples were collected one hour before and after a game whereby an increase in testosterone levels were found amongst winning fans and a decrease amongst losing fans. This was then repeated in a larger second study during the USA World Cup game between Brazil and Italy; results mirrored their pilot study resulting in higher testosterone levels for the Brazilian fans whose team was victorious thus, resulting in lower testosterone levels in the Italian fans (Bernhardt, Dabbs, Fielden & Lutter, 1998). Maughan and Gleeson (2008) have continued hormonal research in football fans, with a focus on cortisol in English and Swedish fans. The authors reported that whilst watching their team on television both sets of fans exhibited elevated heart rates after their team had scored, although Swedish fans reported more elation whilst English fans reported higher levels of anxiety and excitement. However, in this instance there were no differences in salivary cortisol levels.

2.1.4 Learning/Familiarity with Surroundings

Learning or familiarity with surroundings is a factor that has been associated with both home and visiting teams' differing levels of familiarity with the surface in which they play and also with the facility itself (Agnew & Carron, 1994; Courneya & Carron, 1992). Courneya and Carron (1992) have additionally postulated that exploring familiarity may be problematic, thus resulting in the apparent dearth of literature surrounding the factor. One study conducted by Moore and Brylinsky (1995) explored the notion of familiarity and they found it did not significantly affect college basketball teams; the home advantage effect continued to operate despite a change of venue. As a result it was suggested that a venue could operate like an umbrella under which other home advantage factors could operate. The authors concluded that the home advantage could be influenced by mental states that are determined across players, coaches, officials and the crowd. Coaches' perceptions have also been studied where they were asked to rank the importance of a number of factors known to influence the home advantage factors. Collectively, coaches cited familiarity as the primary influential factor that contributed to the home advantage (Gayton, Broida & Elgee, 2001).

One issue which was considered as highly influential and pertained to familiarity was surface type; it was hypothesised that artificial playing surfaces could give the home team a significant advantage over an opposing side. Barnett and Hilditch (1993) examined Football League data and found a slight advantage in favour of home teams who employed an artificial pitch, although the authors stipulated that their results were tentative and were not a cause for concern. Until the 2004/2005 season the utilisation of artificial surfaces had been restricted, and as a result Zanetti (2009) examined Italian amateur players' perceptions of playing on artificial turf. The author found that players preferred this to a 'natural' turf with the exception of receiving abrasions as a consequence. However, it should be noted that in Italy amateur players practice on soil without grass which subsequently casts some doubt on the studies' repeatability in different countries.

Evidence has also emerged regarding a decline in home advantage when a team moves to a new stadium. Pollard (2002) reviewed archival data pertaining to the last year that teams played in their old stadium in comparison to their first year in a new stadium across basketball, baseball and ice hockey. Results indicated a home advantage decline in the first year of a stadium move. The findings have since been extended, with a significant drop in home advantage reported for the first season a team moves to a new stadium. However, during the second season home advantage becomes significantly higher, and no differences exist between this season and the final season in the old stadium. Therefore, the results indicate a one season temporary decline (Wilkinson & Pollard, 2006).

2.1.5 Travel Factors

Travel factors have been posited as a potential contributor to a visitor's poorer performance. Schwartz and Barsky (1977) stated that travelling to different cities could be stressful for a sports performer due to long trips, living in hotels and a change in eating routines which could lead to a disruption in routine. However, the authors also claimed that in baseball the impact of travel as a contributing factor becomes equivocal as visitor disadvantage is less pronounced. This occurred even though baseball players spend more time travelling than in any other sport. It has also been suggested that if travel fatigue were to be considered a factor then as a result home advantage would increase during the second half of a season due to the toll that it takes on competitors. However, this was not substantiated and statistics revealed that in baseball and football the home teams won 53% and 59% of games irrespective of season time. One instance of a second half season decline, albeit minor, was found in basketball; the five prominent teams won 82% of their home games compared to a second half season at 81%. In basketball, a significantly greater home advantage was found when teams had to travel over 200 miles; the advantage declined when the opposition travelled 175 miles and further declined when the visiting team travelled 150 miles (Snyder & Purdy, 1985).

The notion of travel affecting the home advantage has been dismissed by Pollard (1986) due to standards of travel for professional football teams significantly improving largely through speed and comfort. However, it was noted that a slightly lower home advantage existed in the top division which was attributed to the luxury of teams being able to travel in advance of a game rather than on the same day. As a result of these findings it was concluded that any adverse effect associated with travel fatigue were minimal. Contrary to this, conflicting evidence does exist in the shape of World Cup football where it was found that game importance did not affect the home advantage; the greater distance travelled to a game and the fewer days between games resulted in a worsened team performance (Brown, Van Raalte, Brewer, Winter, Cornelius et al., 2002). In a more recent study, endocrine responses associated with travelling to competition have been studied. National skeleton bob athletes salivary and plasma cortisol levels were taken to ascertain if a relationship existed with long haul travel. Results indicated that differences occurred between sample types (plasma vs. salivary) and also that cortisol levels were suppressed on day 1 and day 2. However, levels returned to baseline within around 4 days in plasma and around 7 days in salivary (Bullock, Cox, Martin & Marino, 2009).

2.1.6 Rule Factors

Courneya and Carron (1990) proposed that in some sports rules favour the home team. An example of this can be found in baseball, the home team has preferential practice times on game day, the opportunity to submit its team last, the opportunity to bat last and enforcement of the home leagues designated hitter rule. In their study to explore rule factors the authors studied softball where results revealed no differences between the number of games won when batting first as opposed to last. In addition, no differences were found regarding gender comparisons, high or low ability groups or early season play versus late season play. Rule factors have been recently studied regarding batting order in baseball with similar findings noted, whereby batting order did not have any effect. It was consequently concluded that rule factors provided a minimal if at all apparent contribution to the home advantage (Bray, Obara & Kwan, 2005). It

should be noted that there are no studies pertaining to rule factors in relation to football; as a consequence of this rule factors will be omitted from studies in this thesis.

2.2 Additional Home Advantage Explanations

In addition to the factors outlined above there are a number of further plausible explanations that have been developed which could also have an impact on why teams perform better at home than they do away. Many of these additional factors, excluding referees, have not been included in Courneya and Carron's (1992) Game Location Framework but are instrumental in understanding the complexity of the home advantage. The factors should also be noted in terms of their influence and also the possible confounding effects that they may impose; such factors consist of impact of the referee, team quality, mood differences, home choke and hormonal influences.

2.2.1 Referees

Home advantage not only affects the players, fans and managers of a team; it can also have an effect on referees as well (referees will be discussed in more detail in Chapter 7). The exact effect and intensity a home crowd has on referees at sporting contests has been stated as difficult to ascertain due to visiting teams expecting decisions to favour the home team, resulting in increased risk taking (Neave & Wolfson, 2004). Football referees have been considered as facing intense pressure and criticism from external agencies where they experience immediate and unrestrained negative feedback (Wolfson & Neave, 2007). In support, Burke, Joyner, Pim and Czech (2000) stated referees felt significantly less anxious after refereeing a basketball game than they did beforehand. Referees have collectively identified three sources of aggression comprising spectators, players and coaches (Folkesson, Nyberg, Archer & Norlander, 2002).

Nevill, Balmer and Williams (2002) investigated whether the absence or presence of crowd noise could influence varying levels of qualified referees in their decision-making. The authors reported that those referees who received the 'crowd noise' condition awarded

significantly fewer fouls against the home team (15.5%) due to increasing uncertainty. Moreover, those referees who had been allocated to the noise condition gave similar decisions to the actual match referee. In marked contrast, referees who were allocated to the 'absence of noise' condition were more certain with their decisions, awarded a greater number of fouls against the home players and chose more no foul options. A study conducted by Sutter and Kocher (2004) found that home bias existed in the German Bundesliga and noted that football referees were more likely to award more legitimate penalties to the home team as opposed to the away team. In addition the authors stated that in the 2000/2001 league that home teams were awarded 55 penalties; however, visiting teams were awarded only 21. Dawson, Dobson, Goddard and Wilson (2007) from their statistical research also revealed that home team bias is a very plausible factor when considering disciplinary sanctions. Dohmen (2005) has provided empirical evidence to suggest that social pressure exerted from a home crowd could influence referees' decision making. His research reported that German football referees lengthened exciting games whereby favour was shown to the home team in terms of allowing additional time when they were behind by one goal; this was strengthened when the crowd consisted of mainly home supporters. Referees' reactions to crowd preferences were more pronounced with a smaller physical distance between themselves and the crowd. In addition, when the away supporters attended the game in greater numbers the referee's bias was reduced.

2.2.1 Choking Under Pressure: Evidence for a Home Disadvantage

Criticisms have also been directed at the home crowd, more specifically whether a crowd can be conducive to their team. Baumeister and Steinhilber (1984) hypothesised that the presence of a supportive audience could in fact be detrimental to a team's performance in certain contexts. It was found from baseball and basketball archival data that there was a tendency for teams to perform worse at home especially when in a final or in a decisive match. The authors attributed this to "choking" under pressure and awareness from the home players that they were being watched. It has been acknowledged that a home crowd can be instrumental in inspiring

their team to victory, but they can also facilitate a maladaptive self-monitoring and overcautious behaviour in sports performers (Wallace, Baumeister & Vohs, 2005). In three experiments Butler and Baumeister (1998) concluded that despite the negative effects that a crowd can have on their team, performers actually reported they found supportive crowds helpful and less stressful than a neutral or adversarial crowd. Interestingly, performers also wrongly believed that it helped their performance. In contrast, the effect of a home disadvantage has not been found in ice hockey which the authors attributed to differences in the attentional demands required for ice hockey compared to ball games (Gayton, Matthews & Nickless, 1987). This has been re-examined more recently in the National Hockey League (NHL) play-offs with similar conclusions drawn in relation to the home disadvantage. However, a main effect for game location was found which was attributed as supportive of the arousal hypothesis (Voyer, Kinch & Wright, 2006).

This notion of a home choke has received considerable opposition, most notably from Schlenker, Phillips, Boniecki and Schlenker (1995a) who reanalysed this initial data and have refuted claims of a home advantage choke. The authors stated that teams show an ability to overcome pressure in must-win situations in later championship series in baseball and basketball. Furthermore, they postulated that choking occurs due to anticipation of an important failure, not distractions of possible success which has been previously stated. Baumeister (1995), in defence of his original research, immediately responded to their criticisms and stated that the authors merely found that the home choke dropped slightly due to the omission of many home games where teams possibly choked and lost. He further stated that their data could have been affected by a possible confounding variable concerning a new rule change. Schlenker, Phillips, Boniecki and Schlenker (1995b) again defended their conclusions and suggested that their evidence supported the harsher reality of a home choke comprising social pressure plus self doubt rather than the milder disruption of visualisation of success in front of a home crowd. In addition, they claimed that ambiguity now exists regarding the home choke citing Baumeister's refutation and contradictory evidence surrounding the home choke in terms of rule changes and inclusion criteria.

2.2.3 Team Quality

Madrigal and Jeffrey (1999) conducted a study examining the relationship between team quality and the home advantage. They found that all teams had a strong home advantage, although teams categorised as strong won 70% of their home games when matched with similar strong teams, whereas moderate and weak teams won only 64% and 60% respectively when matched against comparable standard teams. In addition, it has been found from analysis of archival data that strong game location effects are apparent via a 22% increase in wins at home; in terms of team quality it was found that higher quality teams drew fewer games at home (Bray, Law & Foyle, 2003). Regarding competitive balance an interesting hypothesis has been generated by Forrest, Beaumont, Goddard and Simmons (2005). The authors have postulated through model simulation that equality of playing talent in the English Football League would result in lower aggregate attendance. In addition it was suggested that games which fans most want to attend are the ones which contain the most uncertainty, with an unequal balance where the stronger team faces the difficulty of playing away.

2.2.4 Ethnicity and Nationality

Glamser (1990) provided evidence for a bias towards black football players who were reported to have an increased caution record away from home; however, at home their disciplinary levels were the same as white players, and this is known to be the only study conducted in this area to date. More recently, Poulter (2009) has reported that statistical results in the Union of European Football Associations (UEFA) Champions League games were in accordance with the known home advantage variables, for instance higher percentage of goals scored at home and more possession. However, he also examined player nationality in football and found that foreign players tended to score more goals at home, whereas domestic players scored a more proportionate level of goals irrespective of venue.

2.2.5 Game Location and Mood

The possibility that certain psychological factors could affect the home advantage has also received some attention; research conducted specifically pertains to mood factors and how a player's mood might affect overall playing performance. Mood factors and changes in mood have also been known to share a relationship with game venue with differences occurring in players' self-confidence, anxiety and anger. Moreover, it should be noted that conflicting evidence is also apparent with regards to mood factors with varying effects.

Psychological mood states have been examined in rugby in relation to playing venue, whereby results revealed no significant differences in pre-game mood irrespective of venue. However, there was a postgame difference in arousal with lower levels exhibited at home games (Kerr & van Schaik, 1995). Terry, Walrond and Carron (1998) investigated the possible relationship between pre-competition psychological states and game location, using the Competitive State Anxiety Inventory-2 (CSAI-2) and the Profile of Mood States (POMS). The authors noted significant differences between home and away venues; participants scored higher on vigour and self-confidence and lower on anger, confusion, fatigue, depression, tension, cognitive anxiety and somatic anxiety when competing at home as opposed to away. However, it has been duly noted that the above study carries some limitations due to the singular nature of data collection with only one home and one away game studied. Bray, Law and Foyle (2003) aimed to rectify these limitations by examining athletes' pre-competition states when they played evenly matched teams over a balanced home and away schedule. The authors found that although players' psychological states were variable, higher scores in self-efficacy and self confidence were evident as well as lower scores in somatic and cognitive anxiety when playing at home compared to away. Waters and Lovell (2002) found no significant differences in football players' mood irrespective of playing venue, although they did find higher perceptions of confidence at home. Further effects of mood and its relationship to hormonal responses associated with winning and losing in competitive and non-competitive situations will be reviewed in the pertaining sections.

2.2.6 Perceptions of the Home Advantage

In their 1992 review Courneya and Carron stipulated the need to further explore the contributing mechanisms of the home advantage. It has already been highlighted throughout the review of literature that the authors posited four game location factors were in existence: home crowd, venue familiarity, travel and rule factors. However, despite these known factors and the associated research that has focussed upon them, there still remains an issue of ambiguity surrounding them. Indeed, this is a sentiment that has previously been echoed by Bray and Widmeyer (2000) who reported that despite intuitive appeal, anecdotal evidence and some empirical support there still remains a dearth of evidence outlining each of the factors contribution, whether it is singularly or in combination with one another. One way to address these issues would be to adopt a perceptual approach whereby athletes, managers, coaches and officials could be asked their perspective on the home advantage. Bray and Widmeyer (2000) have previously identified this as a priority for research in the area and have stipulated that the lack of research exploring perceptions is a shortcoming of the home advantage. It is imperative therefore that an understanding is sought from the agents which are directly involved in the phenomenon, this may provide some validity to Courneya and Carron's (1992) game location factors whilst also potentially uncovering additional explanations.

Minimal studies pertaining to perceptions of the home advantage currently exist. One of the first studies to tentatively explore perceptions in relation to game location was in an unpublished study conducted by Jurkovic (1985) focussing on players' confidence. The author found that from the 74 basketball players that had been surveyed 76% of them reported greater self-confidence levels when playing at home. In an extensive continuation of this work and also to address the dearth of perceptual research Bray and Widmeyer (2000) asked 40 female basketball players a range of questions to assess their perceptions of the home advantage. Specifically, the authors asked the players to determine: whether they felt a home advantage existed in their sport; to estimate the average home winning percentage across their league and also estimate the winning percentage for themselves. Results revealed that players perceived that there was an overall home advantage across their league apportioning an average of home wins at 60.6%. This figure was higher than the actual winning percentage of 55.3%. Furthermore

players' estimated their own team's home winning percentage at an average of 59.6% with the actual percentage being 54.2%. In addition the players listed familiarity with the home court as the major contributor of why they performed better at home, followed by home crowd support and travel factors.

Waters and Lovell (2002) have examined perceptions of the home advantage in a professional football team. In their first study the authors conducted semi-structured interviews and asked players to retrospectively describe their perceptions of playing at home and away. Players revealed they felt more positive, confident and anxious at home whilst also stating that they did not expect to win away from home. Following on from this study Waters and Lovell examined the mood states of players using a shortened Profile of Mood States (POMS) immediately prior to playing at home and away. Quantitative and qualitative methods were utilised to determine mood states, however, no significant venue differences were found between players' mood states. The authors did note that data showed players had significantly higher perceptions of the team's confidence prior to playing at home.

To date only one study has focussed on the home advantage from the perspective of the sports coach. The study conducted by Gayton, Brioda and Elgee (2001) requested 144 high school coaches to rate five potential causes of the home advantage regarding their respective sports. Coaches cited familiarity, crowd support, travel, referee bias and self-fulfilling expectancies contributed to the home advantage in their sport. Furthermore, coaches indicated that they believed familiarity with a home venue was the most influential factor in why their team performed better at home. Interestingly, coaches also indicated that referee bias had the weakest effect. Similarly, only one study has focussed on supporters' perceptions of their role in the home advantage. Wolfson, Wakelin and Lewis (2005) obtained 461 supporters' perceptions utilising internet surveys, where they were required to rate the commonly known causes of the home advantage. Results revealed supporters indicated crowd support as significantly more influential than travel, familiarity, referee bias and territoriality as the major contributor to the home advantage. The authors also noted that fans felt responsible for inspiring their team to victory, believed they could influence referees decisions in favour of their team and they

believed that they could distract their opponents. However, supporters also indicated they did not accept personal blame for their team's poor results.

The research outlined above has highlighted the importance of studying the home advantage from psychological standpoint incorporating the beliefs of those who are incorporated within it. In order to understand the complex mechanisms associated with the home advantage more detailed perceptual viewpoints from multiple agencies need to be ascertained. The research conducted to date has made a tentative attempt at addressing such issues, however, these attempts have been somewhat tenuous and require further clarification and validation. Bray and Widmeyer (2000) also identified the need for more perceptual studies relating to the home advantage. The authors additionally suggested that from gaining insights from the athletes themselves who are directly involved, it could assist in designing interventions which will maximise the positive aspects of playing at home and minimise the negative aspects of playing away. Therefore, incorporating a substantial proportion of research in the current thesis dedicated to exploring perceptual mechanisms from players, managers and referees it is hoped that greater insight can be obtained in order to explain these complex mechanisms.

2.2.7 Home Advantage Overview

The above review of literature has highlighted the multifaceted nature of the home advantage and has outlined the complexity of measurement in ascertaining the influence of these factors. Research pertains to a varying number of sports, agencies involved within the sports such as players, coaches and referees across varying ages and gender. Many authors have acknowledged the difficulty in clarifying the exact effect of these factors on the home advantage due to complex interactions between them. To add further complexity an additional factor has recently been attributed to explaining the home advantage, the notion of a territorial mediated behavioural response encompassing complex hormonal systems. Literature pertaining to territoriality and the endocrine responses associated with it in relation to venue, competition and general exercise will now be reviewed.

2.2.8 Hormones and the Home advantage

The ‘home advantage’ has more recently been explored behaviorally via increased testosterone surges in males. Teams have been known to perform significantly better on their home territories via scoring more points and winning more matches. Testosterone levels have also been found to differ between playing positions, with goalkeepers and defenders exhibiting the higher testosterone surges; this can also be linked to territoriality as these players are known as the last line of defence (Neave & Wolfson, 2003). Territoriality has been extensively studied in the animal kingdom where animals have been known to attack more aggressively when defending their territory, resulting in a greater hormonal rise (to be reviewed in 2.2.9). Testosterone findings have also been replicated in elite ice hockey players who displayed significantly higher levels at home; they additionally found that players’ pre-game cortisol levels were also higher at home. Psychological measures revealed players exhibited higher self-confidence levels at home; whilst away from home they had higher somatic and cognitive anxiety (Carré, Muir, Belanger & Putnam, 2006). In an attempt to extend previous testosterone findings in amateur ice hockey players, Carré (2009) found a significantly higher rise in testosterone levels after a home victory compared to an away victory.

2.2.9 Hormones, Territoriality, Status and Dominance in Animals

Neave and Wolfson (2003) outlined in their study pertaining to the home advantage the concept of territoriality and how this could provide an explanation for the home advantage. Territoriality has been readily applied in animals in order to understand behaviours such as mate finding and guarding which are essential for their survival. An additional model associated with territoriality that has aimed to explain this hormone-behaviour relationship in animals is termed the ‘challenge hypothesis’. This model can account for the testosterone-aggression association especially within animals such as birds and primates (Müller & Wrangham, 2004; Wingfield,

Hegner, Dufty & Ball., 1990). The hypothesis has outlined that at the start of the breeding season, testosterone levels rise to moderate level and during challenges to males that are related to reproduction testosterone levels further rise, which facilitates further aggressive responses in influencing dominance disputes, territory formation and mate guarding (Wingfield, Jacobs, Tramontin, Perfito, Meddle et al., 2000). This rise in testosterone can influence the outcome of the encounter, with a victory leading to an additional rise, whilst a defeat can impact negatively on testosterone levels (Oyegbile & Marler, 2005). Indeed, it has also been reported that when males turn their attention to parental rather than competitive and reproductive behaviours then testosterone levels decline accordingly (Reburn & Wynne-Edwards, 1999). However, it has been reported that instead of reacting to a stressor with an aggressive response, females are more likely to adopt the “tend and befriend” response, whereby they will protect themselves and their offspring to promote safety and decrease stress whilst also striving to create and maintain a network to aid in this process (Taylor, Klein, Lewis, Gruenewald, Gurung et al., 2000).

It has been reported that mice when injected with testosterone displayed transient increases in testosterone levels following an aggressive encounter; this resulted in further aggressive behaviours in a subsequent encounter the following day. However, mice that were injected with a saline solution showed no aggression, indicating that experience alone did not affect aggression (Trainor, Bird & Marler, 2004). Subordination stress resulting in increased cortisol levels has been found in rats; basal cortisol levels were higher and plasma testosterone levels were lower in subordinate rats compared to controls and dominant rats (Blanchard, Sakai, McEwen, Weiss & Blanchard, 1993).

2.2.10 Human Territoriality and Dominance

Territorial dominance has been reported extensively in the animal kingdom as outlined above, but dominance has also more pertinently been linked to human behaviours where its effect has been found in non-sporting contexts. Ardrey (1966) claimed that like animals,

humans have a genetic disposition to claim and defend their perceived territory. An example of this was reported in male students who were found to exert more dominance and more control in decision making tasks when the task took place in their own room compared to someone else's room even if they had not been allocated active control over the situation (Edney, 1975). A similar effect was found by Taylor and Lanni (1981) who reported that male students exerted dominance in their own room even though they were outnumbered and low in the personality trait of dominance. Brown, Lawrence and Robinson (2005) have suggested in organisational contexts that a territorial response is a social-behavioural construct and occurs as a result of interacting with other people. The authors have further suggested that territorial behaviours stem from establishing and maintaining a relationship with an object rather than merely expressing ownership. Altman (1975) identified three territory types which were applicable to humans: primary which can be associated with one's own home evoking a strong protective response; secondary, such as a school or workplace which evokes a moderate protective response; and finally, public, such as a library which evokes a minimal response. It could therefore be deemed that a sporting stadium could be potentially viewed as a secondary territory both for players and fans.

2.3 Hormones, Endocrinology and Biological Psychology

In order to understand the mechanisms involved in a hormonal response to venue it is also necessary to understand how these hormones are produced, secreted and regulated. This section will also provide a brief overview of the associated brain structures with a more detailed account provided for the structures which are instrumental in the secretion and regulation of testosterone and cortisol. In addition, a further in-depth account will also be given regarding the effects of cortisol and testosterone in competitive, non-competitive and sporting situations.

2.3.1 Hormones and Endocrinology: A Background

The terms hormone and endocrine are derived from the Greek words 'ormoa' (to excite) and 'endo' (internal) and 'krinein' (to secrete) respectively (Borer, 2003; Neave, 2008). Hormones are considered as complex chemicals that are released by the endocrine gland and are transported through the bloodstream to a corresponding tissue where it can regulate and coordinate physiological and metabolic functions within that target cell (Baxter, 1997; Borer, 2003). Many bodily processes also fall under the hormonal remit such as metabolism, growth and development, reproduction and regulation of homeostatic processes such as temperature and water balance (Silverthorn, 2009).

2.3.2 The Endocrine Glands

Hormones can be classified; however, there still remains some ambiguity over these classifications. It has been typically agreed that four classifications exist which consist of (a) peptides or proteins, (b) steroids, (c) monamines and (d) lipid-based hormones (Nelson, 2005). These hormones are secreted from a number of different sources within the body and will be outlined below.

2.3.3 The Hypothalamus

The hypothalamus along with the thalamus forms part of the diencephalon and is located directly below the thalamus at the base of the brain (Nelson, 2005). It controls many of the body's activities and is primarily responsible in the regulation of homeostasis (Tortora & Derrickson, 2009). It also provides a "primary interface between the nervous system and the endocrine system" (Nelson, 2005 p49) comprising of several nuclei in four major regions: mammillary region, tuberal region, supraoptic region and the preoptic region (Tortora & Derrickson, 2009). These interconnected nuclei which are comprised of modified neurones which release neurohormones can be separated into those that are secreted directly into the circulation via the posterior pituitary and those that are secreted into the anterior pituitary gland

(Neave, 2008). Furthermore, the hormones secreted into the anterior pituitary gland are known as 'releasing hormones', although they can also be known as 'releasing factors' because they can inhibit or stimulate the release of hormones in the anterior pituitary gland (Becker & Breedlove, 2002)

2.3.4 The Pituitary Glands

The pituitary gland shares a connection with the hypothalamus, and the latter communicates with the pituitary via the hypothalamic-hypophyseal portal system (Nelson, 2005). This is a special closed blood circuit incorporating blood vessels such as capillaries to deliver the hypothalamic-releasing factors to the anterior pituitary (Becker & Breedlove, 2002). The pituitary gland is comprised of three lobes: anterior, intermediate and posterior. The intermediate lobe has been reported as having no role in human function; however, the anterior and posterior lobes do play a major role in endocrine function (Wilmore, Costill & Kenney, 2008). The anterior pituitary gland is responsible for the distribution of many excitatory hormones including corticotropin, gonadotropin, growth hormone, thyrotropin. Furthermore, it is also responsible for the distribution of somatostatin and dopamine both of which are inhibitory hormones (Neave, 2008).

2.3.5 Steroid Hormones

The gonads and the adrenal glands are referred to as the most common steroid hormones in humans (Nelson, 2005). Gonadal steroid hormones are produced by the ovaries in females and testes in males and are regulated by tropic hormones from the anterior pituitary (Neave, 2008). The testes produce androgens, testosterone and dihydrotestosterone in males, and in females the ovaries make the steroid hormones of estrogens (estrodiol, estriol, estrone) and progestins (Becker & Breedlove, 2002). The adrenal glands, situated superiorly to the kidneys secrete multiple hormones and comprise the adrenal cortex. The adrenal cortex can be divided into three zones; zona glomerulosa which secretes mineralcorticoids (aldosterone), the inner

zona reticularis which is responsible for the secretion of androgens, and finally the middle zona fasciculate which secretes glucocorticoids, in particular the stress hormone cortisol (Silverthorn, 2009).

2.3.6 The Hypothalamic-Pituitary-Adrenal Axis

The hypothalamic-pituitary-adrenal axis (HPA) (see Figure 2.1) becomes activated immediately following a stressor with the release of corticotrophin-releasing-hormone (CRH) within a few seconds. ACTH then becomes activated within approximately 15 seconds and glucocorticoids within a few minutes (Nelson, 2005; Sapolsky, 2002). The HPA axis is controlled via hypophysiotrophic neurons in the hypothalamic paraventricular nucleus (PVN) within the medial parvocellular division (Herman, Ostrander, Mueller & Figueiredo, 2005).

Stress causes the release of epinephrine from the medulla and norepinephrine from the sympathetic nervous system initiating the activation of the hypothalamic-pituitary-adrenal axis. The hypothalamus then secretes corticotrophin-releasing-hormone (CRH), which is a 41 amino acid peptide within a few seconds (Nelson, 2005). Arginine vasopressin (AVP) acts in conjunction with CRH in stimulating the secretion of ACTH within approximately 15 seconds. These two neuropeptides, AVP and CRH are secreted in non-stressful situations in a pulsatile and circadian manner into the hypothalamic-hypophyseal portal system (Horrocks, Jones, Ratcliffe, Holder, White et al., 1990). During stressful situations the pulsatile release of PVN, CRH and AVP increases into the portal system. In addition, but dependent on stressor type, cytokines, angiotensin II and lipid mediators of inflammation are secreted and act on the hypothalamic, pituitary and adrenal components of the HPA axis (Charmandari, Tsigos & Chrousos, 2005).

Circulating ACTH controls and regulates glucocorticoid secretion by the adrenal cortex, and this process takes approximately fifteen seconds (Nelson, 2005; Tsigos & Chrousos, 2002). ACTH also displays a diurnal pattern, peaking at the time of waking and then as the day

progresses it steadily declines, this can also be mirrored with cortisol which exhibits the same diurnal pattern (Neave, 2008).

2.3.7 The Limbic System

The limbic system is instrumental in the stress response and HPA axis activation; it includes the amygdale, hippocampus and cingulate gyrus (Klein & Thorne, 2007). As a collective it is these structures that are responsible for our motivation and emotion (Neave, 2008). Klein and Thorn (2007) have described this system as accountable for the emotional impact of the agony and ecstasy experienced in victory and defeat in sporting competitions.

2.3.8 The Stress Response

A stress response occurs when physiological homeostasis has been interrupted which requires certain physiological and behavioural responses to restore order (Nelson, 2005). Indeed, the first pioneers of the physiological stress response were Cannon (1871-1945) and Selye (1907-1982) who documented the roles of epinephrine and the role of glucocorticoids respectively, both authors eluded to a non-specific stress response which can be elicited via many different stressors with different outcomes (Nelson, 2005). The stress response is comprised from two endocrine systems both of which involve the adrenal gland, whereby the medulla of the adrenal gland secretes epinephrine (adrenalin) and the adrenal cortex secretes the glucocorticoids (Sapolsky, 2002).

The stress response has been noted to occur in three distinct stages; fight or flight response, slower resistance reaction and exhaustion (Tortora & Derrickson, 2009). The fight or flight response occurs from the direct action of epinephrine (adrenalin) and norepinephrine which are collectively referred to as catcholamines (Wilmore, Costill & Kenny, 2008) and they in turn prepare the body for physical activity. More specifically it supplies large amounts of glucose and oxygen to the organs that are immediately required to respond to perceived danger

for example muscles which may have to fight or flee and the heart which needs to distribute blood to the brain and working muscles (Tortora & Derrickson, 2009). However, it has been stated that there are some individual differences in regards to the stress response suggesting that “what might be pathogenically stressful for one individual might be something that someone else would pay to do recreationally” (Sapolsky, 1994, p261).

2.3.9 Cortisol

The glucocorticoids are responsible for metabolism regulation and provide resistance to stress they include corticosterone, cortisone and most importantly cortisol, which has been considered as the most abundantly produced and accounts for approximately 95% of glucocorticoid activity (Tortora & Derrickson, 2009). ACTH acts on the adrenal cortex to facilitate the synthesis and release of cortisol which as a result inhibits ACTH and CRH (Silverthorn, 2009). Cortisol has been recognised as a key assessor of adrenocortical function and also as an indicator of disturbances within the HPA axis (Aardal & Holm, 1995). Cortisol displays a diurnal pattern, with higher levels in the morning and lower levels in the evening. Kirschbaum and Hellhammer (1989) examined numerous studies and produced some general reference values as a result; they found levels of 14.32, SD = 9.1 nmol/l between 7 and 9 am, 4.50, SD = 3.5 nmol/l between 3 and 5pm and 1.96, SD = 1.7 nmol/l between 8 and 10 pm. Although, general reference values are scarce one of the leaders in salivary assays Salimetrics have also produced some normal ranges for cortisol (see Table 2.1). Kudielka, Schommer, Hellhammer and Kirschbaum (2004) have re-analysed previous studies and found that the net increases for stress related free salivary cortisol, plasma cortisol and ACTH did not differ in relation to time of day. However, they did find that pre-stress free salivary cortisol and free plasma cortisol differed from morning to afternoon and they suggest that the adrenal glands could be more sensitive to ACTH in the morning. Cortisol levels are also known to increase with hypoglycaemia, obesity, physical and mental stress and sporting activity (Mougios, 2006).

Table 2.1: Normal Ranges for Cortisol (Salimetrics, 2008).

Population	Age Group (years)	Number	AM range (nmol/L)	PM range (nmol/L)
Adolescents	12-18	403	0.58-24.37	*ND-7.15
All Adults	21-70	195	2.59-42.81	*ND-9.91
Adult Males	21-30	26	3.09-20.51	*ND-8.50
Adult Males	31-50	67	3.36-42.81	*ND-9.91

*non-detected

2.3.10 The Hypothalamic-Pituitary-Gonadal Axis (HPG)

Hormones that are produced by the ovaries and testes are collectively known as gonadal steroid hormones (Becker & Breedlove, 2002). The gonads are controlled via tropic hormones from the anterior pituitary (see Figure 2.1) males and females have different forms of gonads namely the ovaries and testes which produce three different sex steroid hormones, androgens in males and estrogens and progestins in females (See Neave, 2008 for review of female gonads). They form two sub-compartments; one to produce hormones and the other produced gametes namely sperm or eggs (Breedlove, Rosenzweig & Watson, 2007). Androgens such as testosterone are produced by the adrenal cortex via the pituitary gland and occur in response to ACTH (Becker & Breedlove, 2002).

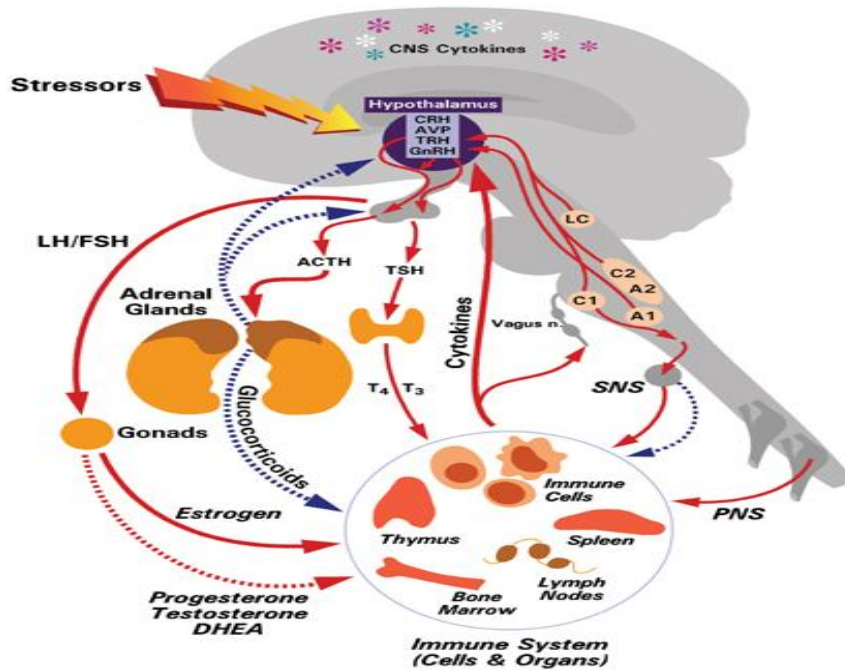


Figure 2.2 A Diagrammatic representation of the HPA and HPG Axis (from Marques-Deak, Cizza & Sternberg, 2005).

2.3.11 Testes and Testosterone

The testes are bilateral endocrine glands that are housed within a protective sac called a scrotum (Nelson, 2005). Located within the testes are Sertoli cells which are sperm producing cells and there are also Leydig cells or interstitial cells which are responsible in the production and secretion of testosterone (Breedlove, Rosenzweig & Watson, 2007). The Sertoli cells are androgen-binding proteins which are responsible for transporting androgens around the blood (Nelson, 2005). Pituitary gonadotrophins include follicle stimulating hormone (FSH) which is responsible for sperm production in men and ovarian follicle maturation in women (Corr, 2006) and luteinising hormone (LH). The production and secretion of testosterone is regulated by LH which is responsible for the secretion of sex steroids testosterone from the testes in males and oestrogen from the ovaries in female (Corr, 2006). FSH and LH are in turn affected by gonadotropin-releasing hormone (GnRH) which occurs as a response to the hypothalamus

receiving an environmental stimulus (Neave, 2008). Testosterone has been described as one of the best known hormones outside of professional medicine, with interest generating from its involvement with all organs and systems; it also exerts its influence on physical appearance, social status and sexuality (Zitzmann & Nieschlag, 2001). Normal ranges for testosterone have also been provided by Salimetrics (See Table 2.2).

Table 2.2. Testosterone Normal Ranges (Salimetrics, 2008).

Gender	Number	Mean (pg/mL)	Standard Deviation (pg/mL)
Males	20	86.17	34.8
Females	20	33.44	8.24

There are a number of cyclical changes between behaviour and endocrine changes (see Figure 2.2) which can change depending on a given situation, our expectations and can influence our past and future behaviours which in turn can alter hormone release (Breedlove, Rosensweig & Watson, 2007).

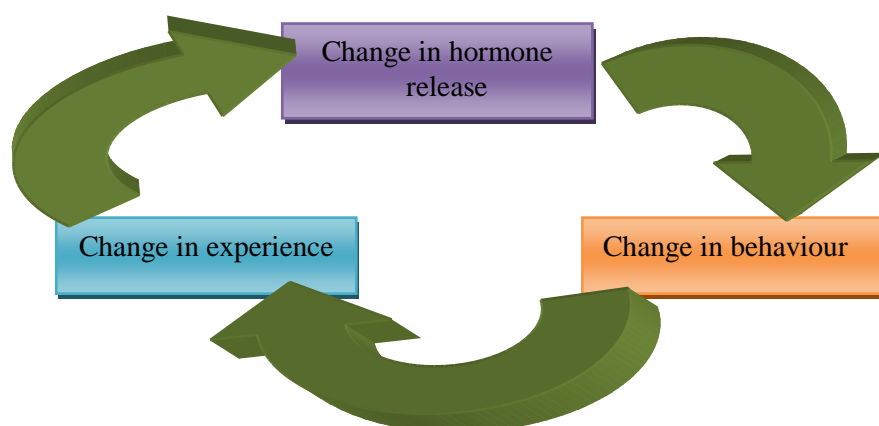


Figure 2.3: The cyclical relationship between hormones and behaviour (from Breedlove, Rosensweig & Watson, 2007).

2.3.12 The Testosterone-Cortisol Relationship

There remains some ambiguity over the relationship between testosterone and cortisol, namely that an increase in stress hormones such as cortisol can lead to testosterone suppression (Hackney & Dobridge, 2003). Increased cortisol has been posited to inhibit steroidogenesis in the Leydig cells via the glucocorticoid receptor- mediated mechanism (Hales & Payne, 1989). This effect has been observed in rats, where authors have stated that increased pharmacological cortisol can disrupt the binding of LH on the testes (Bambino & Hsueh, 1981). This effect has also been found in men who were administered pharmacological doses of cortisol. The data indicated that an acute increases in serum cortisol levels resulted in a significant decrease in testosterone (Cumming, Quigley & Yen, 1983). The effect has also been found in a male exercise sample where a significant negative relationship was found between cortisol and total testosterone. However, there were no differences between the hormones in their resting samples (Brownlee, Moore & Hackney, 2005).

The ambiguity continues as it has also been stated that testosterone can lead to the suppression of cortisol levels which occurs due to testosterone levels in the blood increasing during the initial stages of stress (Chichinadze & Chichinadze, 2008). This effect has been found in high ranking male baboons where after an initial stressor onset and testosterone levels decline in subordinates, dominant males still display transiently elevated levels of testosterone (Sapolsky, 1982). An explanation has been given to explain the resistance from the gonadal axis in relation to a stressor; namely decreased sensitivity of the gonadal axis in relation to glucocorticosteroids and the counteracting effects of sympathetic activation (Wingfield & Sapolsky, 2003). Although there seems to be some conflicting evidence surrounding the relationship between these two hormones, it should also be noted that these hormones can increase simultaneously. Many authors have noted elevations in both testosterone and cortisol in individual and team competitions (See Salvador, 2005 for review).

2.3.13 Hormone Regulation

Hormones are known to be regulated by the brain via feedback loops and Nelson (2005) has stated that there are “two patterns of internal hormone regulation; regulation via physiological by-products generated in response to their functions and secondly regulation by stimulatory or inhibitory factors” (p101). Feedback loops can be positive or negative (see Figure 2.4) in a positive feedback loop the secretion of a particular hormone promotes a further secretion of that hormone (Klein & Thorne, 2007). In addition, positive feedback is known to occur when a rapid endocrine response is required for instance during stressful situations and the glucocorticoid response (Neave, 2008). A negative feedback loop inhibits a hormones subsequent release, this is the most common type of feedback and can include many hormones within the regulatory chain and an example of this includes GnRH and the gonadotrophin response (Nelson, 2005).

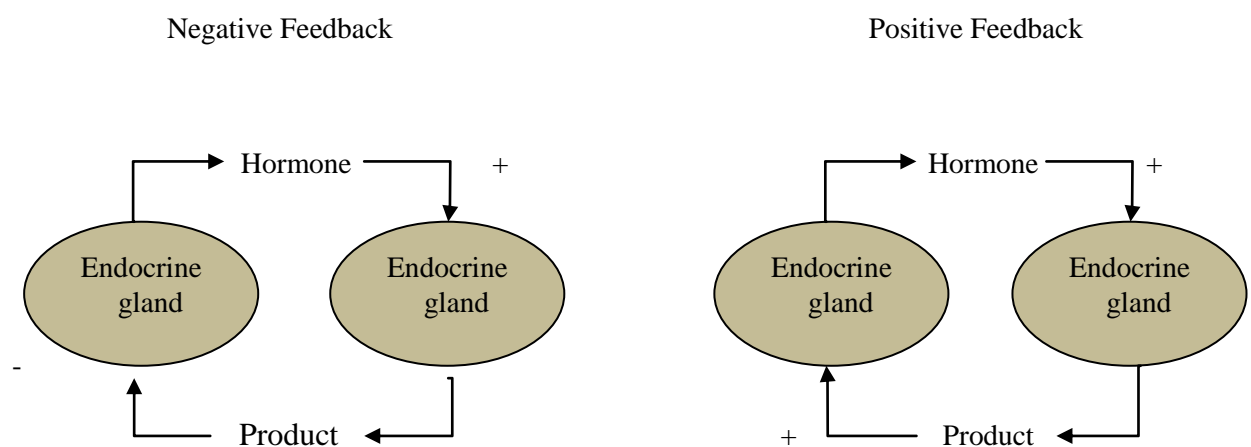


Figure 2.4 Positive and negative feedback loops (from Nelson, 2006).

2.4 The Androgenic Response to Exercise

Previous research has documented that prolonged exercise of increasing duration and intensity can induce an acute hormonal response on the adrenal cortex, affecting cortisol and

the pituitary testicular axis affecting testosterone (Sutton, Coleman, Casey & Lazarus, 1973; Vuorimaa, Ahotupa, Hakkinen & Vasankari, 2008). This response can also be dependent on the type of exercise that is being performed for instance, aerobic, anaerobic and strength based activities. This section aims to outline the physiological demands placed on the football player and the effects of exercise on testosterone and cortisol levels.

2.4.1 Physiological Demands on the Football Player

Football players typically play 90 minutes of intermittent activity, two periods of 45 minutes with 15 minutes break at a half time interval. Maughan and Gleeson (2004) have stated that outfield players cover an average distance of between 8 and 13km and that the average player expends around 5000kj per game. The authors also stated that on average the total distance covered for an outfield player consists of 37% jogging, 25% walking, 20% cruising, 11% sprinting and 7% walking backwards. Characteristically, football players are changing in height and weight with goalkeepers, central defenders and strikers have been found to be taller, heavier and older than players in wider positions. Moreover, in the successful teams players are younger, taller and more linear in body shape than in other teams (Nevill, Holder & Watts, 2009).

2.4.2 The General Effects of Exercise on Testosterone and Cortisol

As previously stated cortisol can provide an indicator of both physiological and psychological stress; testosterone, however is more associated with aggression and dominance. Research has indicated that exercise has an effect on both hormones and their levels and these changes are dependent on sporting activity and exercise intensity. In an early cortisol study conducted by Few (1974) male participants were split in to control, high and low exercise groups and received an intravenous cortisol injection. It was reported that heavy exercise resulted in an increase in plasma cortisol, whilst a lower intensity resulted in variable but usually downward cortisol changes. Furthermore, in the heavy exercise group the removal rate of cortisol was more

rapid than in the light exercise group. In endurance trained male athletes testosterone has been known to be lower than in normal controls (Hackney, Sinning & Bruot, 1988). However, the effect of decreased cortisol levels has also been found in sedentary males who performed bicycle ergometer training, levels decreased after one week of exercise (Chwalbińska-Moneta, Kruk, Nazar, Krzemiński, Kaciuba-Uścilko et al., 2005).

Testosterone and cortisol levels have been studied with regards to training adaptation in elite male rowers, significant changes were found over a 6 month period for both hormones which corresponded with mean weekly training volume. The results suggested that the hormones are sensitive to training volume (Purge, Jürimäe & Jürimäe, 2006). Resistance exercise also seems to elicit a different response with higher levels evident in those who participate in resistance-type exercise (Kraemer, Kilgore, Kraemer & Castracane, 1992). Tremblay, Copeland and Van Helder (2004) partially support these findings, and report that overall endurance trained athletes exhibited less pronounced hormonal changes than resistance athletes. The authors also found that androgens in general increased in response to exercise, more so with resistance activity, but cortisol only increased after resistance exercise.

Cortisol levels have also been examined in relation to submaximal exercise using the Wingate anaerobic test, at up to 85% of maximum heart rate where a non significant increase in salivary and serum cortisol levels were found (Ben-Aryeh, Roll, Lahav, Dlin, Hanne-Paparo et al., 1988). It has been stated that many studies have exceeded the 70% VO_2 max criteria to induce cortisol secretion many have not initiated significant elevation due to obtaining samples immediately post exercise, it has been further suggested that saliva samples should ideally be taken at 10-15 minute intervals and at 30 minutes post exercise (Kirschbaum & Hellhammer, 1994). The diurnal pattern associated with cortisol has been known to become altered with training, Minetto, Lanfranco, Tibaudi, Baldi, Termine et al. (2008) studied football players and found that cortisol levels during the first 30 minutes of waking were significantly increased both before and after a 7 day period of intense training. The authors further stated that pre-post training changes in the awakening cortisol response showed high-inter-individual differences indicating different differences in HPA axis adaptations.

2.5 Hormones and Competition

Competitive encounters are also known to have an effect on hormone levels and many studies have acknowledged both physiological and psychological effects occurring as a result. Hormonal responses have been known to change depending on the competitive outcome namely whether one has won or lost (Archer, 1988).

Some authors have aimed to examine the relationship between hormones, competition and game outcome where many sporting contests provide an opportunity to study these effects directly. Sporting competitions can provide many avenues to explore the hormonal responses to competition due to not having a pre-established outcome and equality of opportunity (Kemper, 1990). Furthermore, competition has a time-specific duration and an immediate ranking attribution dependent on outcome (Salvador, 2005).

2.5.1 Non-Physical Competition

Hormonal differences have also occurred in non-athletic competitive situations. For example, Gladue, Boechler and McCaul (1989) assessed testosterone and cortisol levels in a manipulated reaction time task where male participants were assigned to a closed contest group where one person barely defeated their opponent, or they were assigned to the decisive condition where victory was clear. It was found that winners had higher overall testosterone than losers, with no observed differences in outcome, and no differences in cortisol. McCaul, Gladue and Joppa (1992) supported these findings, and reported that in a coin toss study winners reported a more positive mood change whilst also exhibiting significantly higher testosterone levels than losers. Gender differences and hormones have also been studied during a video game contest; a pre-contest rise in male testosterone levels was apparent, although there were no contest outcome effects. In females, it was found that their testosterone levels declined over the course of the experiment, although their cortisol levels were significantly higher than their male counterparts (Mazur, Susman & Edelbrock, 1997).

The effect of ability and chance on testosterone levels in a vocabulary competition has been studied, where task outcome was determined on the participant's ability, results showed that performance was not sexually differentiated, and testosterone for task performance was negatively correlated. In addition, male winners had lower basal and post-task testosterone levels and male losers had a greater decrease in basal testosterone to post-task (van Anders & Watson, 2007). Testosterone levels have also been shown to decline amongst socially anxious men who have lost in a predetermined win or lose competitive scenario, which the authors state is in-keeping with pronounced social submission stages to a social dominance threat (Maner, Miller, Schmidt & Eckel, 2008). Mehta and Josephs (2006) conducted a study to examine the effects of losing on testosterone, male students took part in a number tracking task where they competed against one another. Results showed that winners testosterone levels did not increase relative to losers; approximately 48% of participants said they would indeed compete again, and winners and losers did not differ in their decisions and losers whose testosterone levels rose were more likely to compete again than losers whose testosterone had dropped.

Hormonal responses have also been studied in relation to non-physical group competition, a study conducted by Wagner, Flinn and England (2002) focussed on group alliances comprising of males from two different Caribbean village's competing in a domino contest; results showed that testosterone and cortisol levels were more pronounced in between-village contests compared to within-village contests. More recently, it has been found in male and female individuals who completed a reasoning task that their testosterone levels were positively related to individual competition. However, the same effect was not found for collective intergroup competition which was negatively related to performance (Mehta, Wuehrmann & Josephs, 2009).

2.5.2 Individual Competition

Mazur and Lamb (1980) conducted a series of experiments to examine testosterone and status whilst additionally looking at the effects of winning and losing. Their first study

concentrated on experienced tennis players where they reported that matches which ended in a clear victory were accompanied by a post-match rise in testosterone and also a positive change in mood. However, winners of a close match exhibited a post-match decline in testosterone levels, whereas the testosterone levels of match losers followed the normal diurnal pattern during the afternoon. In the authors second experiment entitled “lottery” fourteen participants gave blood samples and were assembled at the experimenter’s home. A draw took place which would determine seven “winners” of \$100 prizes; it was found that winners did not show any subsequent rises in testosterone which were any greater than the losers. However, the authors did note that those individuals who reported continual positive moods following the draw had higher levels of testosterone. In the third experiment medical students were studied with regards to their university graduation. Results showed that a rise in testosterone occurred for newly graduating students between 1-2 days post ceremony, this was partly linked to their mood. The authors concluded that from a person having directly contributed to a success then the accompanying elated mood associated to the success can contribute to a rise in testosterone.

In university tennis players, testosterone levels rose before a competitive match and those individual’s with the highest testosterone levels also displayed positive mood improvement. Mean testosterone levels post-game rose for winners relative to losers, which further resulted in higher testosterone levels being carried over to the next match. In addition, cortisol levels were also studied and were not deemed to be related to competitive outcome; however it was related to seeding with top players exhibiting lower levels of cortisol (Booth, Shelley, Mazur, Tharp & Kittock, 1989). Continuing with tennis it has been found that cortisol levels in male and female players showed an anticipatory rise prior to competition, with both genders exhibiting the same pattern in cortisol response. An effect was also found regarding game outcome with losers displaying higher levels of cortisol (Filaire, Alix, Ferrand & Verger, 2009).

In a different competitive context Aubets and Segura (1995) studied free cortisol concentrations in trained swimmers during competition and an exhaustion treadmill test. The authors found that cortisol levels were significantly higher before and after the competitive

situation than the treadmill test, with females exhibiting higher levels than males. This competition effect has also been found in paragliders where cortisol values showed a significant increase on the day of competition where it also remained elevated for the rest of the day (Filaire, Alix, Rouveix & Le Scanff, 2007). Kivlighan, Granger and Booth (2005) studied male and female university rowers' testosterone and cortisol responses to a rowing ergometer competition and the authors found differing levels of endocrine response varied according to gender. Testosterone levels were higher in female novices compared to experienced females and males, elevated pre-competition testosterone levels predicted an overall poorer performance. However, rising levels of pre to post testosterone predicted faster times in the expert rowers whereas in novice male rowers their testosterone levels declined. In addition, the authors examined cortisol levels in the same cohort and found that baseline levels before competition were higher and levels rose again after competition; levels were higher in novice rowers. Differences in marathon canoeists and their anxiety levels have also been studied in relation to hormonal consequences. It was found that canoeists who stated that anxiety was positive to their performance showed an increase in testosterone before competition and lowered cortisol in comparison to those who viewed anxiety as negative to their performance (Eubank, Collins, Lovell, Dorling & Talbot, 1997).

2.5.3 Competitive Fighting

Competitive fighting is also known to elicit hormonal changes and can be used as a near direct comparison to the animal literature and the models and hypotheses associated with it. Elias (1981) blood sampled competitive wrestlers 10min pre-fight, 10min post and 35min post-fight in a single competitive match. He reported concentrations of cortisol and testosterone increased consistently during the wrestling match whilst testosterone-binding globulin decreased, thus leading to an increase in testosterone availability. Furthermore, winners displayed a greater rise in cortisol and testosterone than losers. Salvador, Simón, Suay and Llorens (1987) blood sampled 14 male Judo competitors 10min pre-fight and 45min post-fight

where the authors reported winning and losing did not significantly alter testosterone and cortisol levels. However, the authors did state that members of an experienced regional team increased their testosterone levels after competition whereas those who were not members had decreased levels.

Suay, Salvador, Gonzalez-Bono, Sanchis, Martinez et al. (1999) found in Judo that a pre-competition anticipatory rise in testosterone and cortisol was followed by significantly higher cortisol levels in winners than losers. However, this effect was not found for testosterone. This anticipatory rise in cortisol for Judo competitions has also been substantiated by Filaire, Maso, Sagnol, Ferrand and Lac (2001) although, the authors noted in contrast to the previous study that there were no outcome effects. Testosterone levels were however, significantly greater in losers than winners after their last fight. Also in Judo, positive relationships between testosterone and offensive behaviors have been determined, with a positive correlation between number of attacks and testosterone level. Conversely, cortisol levels were also related to behavioural categories with an apparent negative correlation with aggressive responses (Salvador, Suay, Martinez-Sanchis, Simon & Brain, 1999).

2.5.4 Team Competition

It has been stated that team competitions can facilitate the cooperative and coordinated work of a group to cope with the conflict of competing against another social group in order to attain a collective goal (Salvador, 2005). Hormonal differences have been found in basketball players during a competitive encounter. Testosterone levels correlated with the score and playing time ratio which indicated a higher contribution to the team outcome and overall outcome variances were not apparent for winners or losers. In addition, cortisol levels also rose for both winners and losers but no statistical differences between groups were apparent (Gonzalez-Bono, Salvador, Serrano & Ricarte, 1999). In a football study 18 female and 22 male players provided saliva samples 1hour pre-game and 15min post-game, it was reported that match competition increased testosterone and cortisol in male and female players. Some gender

variability was evident, namely that mean post-game cortisol levels increased for men who played whereas in those who did not play cortisol levels decreased. Post-match testosterone levels were on average higher but this did not reach statistical significance, however, post-match testosterone was significantly correlated to teammate ratings on the player rating scale. In females, the authors found that post-match testosterone and cortisol levels were significantly higher than before game, pre-match testosterone was correlated with teammate ratings (Edwards, Wetzel & Wyner, 2006). Salivary cortisol levels have been further studied in female handball and volleyball competitors where samples were taken five minutes before and after a competitive match. Results showed higher cortisol concentrations pre and post-competition and also significantly higher levels during competition for both sports groups. The authors noted adrenocortical changes during competition were influenced by energy systems, personality and anxiety in relation to match outcome (Filaire, Le Scanff, Duché & Lac, 1999).

Endocrine responses to exercise have also been studied in American football; players were split in to two groups, starters and red shirts, which were explained to be collegiate athletes who do not play in intercollegiate games in the season. There were no changes in testosterone levels, however cortisol levels were significantly higher for starters at 15 minutes before game conclusion than the red shirts levels. It was suggested by the authors that these elevated changes in cortisol could have been possibly attributed to stress, diet, inflammation or the effect of high intensity exercise (Hoffman, Maresh, Newton, Rubin, French et al., 2002). Continuing with American football, Hoffman, Kang, Ratamess and Faigenbaum (2005) examined hormonal changes throughout an intercollegiate season. The authors reported a significant main effect of time for cortisol and testosterone-cortisol ratio, with cortisol levels declining 10 days post-training camp compared to pre-training camp. They attributed these differences to reflect the high intensity nature of the training camp. More recently, Oliveira, Gouveia and Oliveira (2009) have studied the effect of testosterone on female football players although it should be noted that this is without the emphasis on venue. In addition the authors reported that testosterone changes were evident between winners and losers, although there were no changes evident for cortisol on

game outcome; this was coupled with a positive mood state in winners and a more negative mood state in losers. An anticipatory pre-game rise for both hormones was also apparent.

2.5.5 Biosocial Model of Status

One model that has aimed to determine the hormonal effects of an aggressive or competitive encounter in competition whether it be in humans or animals is Mazur's (1985) biosocial status model. The main focus of the model's hypothesis centres mainly upon testosterone, although references have been made regarding cortisol (Salvador, 2005). The biosocial status model (see Figure 2.5) has proposed that status ranks in primates were attributed to those who displayed dominant behaviour which resulted in high and increasing levels of testosterone opposed to those who displayed defensive behaviours, indicating a reciprocal relationship between dominance and testosterone (Mazur, 1985). In addition, during competitive situations a victory would lead to further testosterone increase and a defeat would produce a testosterone decrease (Salvador, 2005).

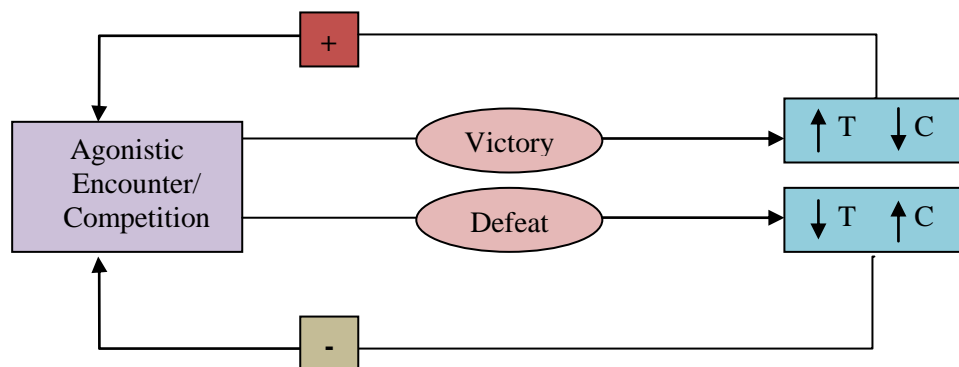


Figure 2.5 A representation of Mazur's biosocial model of status (depicted by Salvador, 2005)

2.5.6 Testosterone, Aggression, Status and Dominance

It has been documented by many authors that a reciprocal relationship exists between testosterone and aggression both in humans and animals (see Book, Starzyk & Quinsey, 2001 for

review). It should be noted, however that there remains some inconsistency regarding the generalisation of animal aggression studies and the relationship to human studies, which is due to the numerous methodological differences between human and animal research (Archer, 1991). It has been highlighted by Albert, Walsh and Jonik (1993) in their review that human aggression does share similarities with defensive aggression in non primate mammals for instance, it can be demonstrated in all ages, in both genders and it is non-dependent on seasonal changes or experiential events.

Archer (2009) has reported that human aggression can be viewed from four explanatory perspectives, the adaptive value which can be viewed extensively in the animal kingdom and includes resource protection. Secondly, via phylogenetic origins of aggression which are brain mechanisms involved in the emotional impact of anger, and how aggression manifested. Thirdly, through origins of aggression and how through evolution this has developed and adapted according to ones experience and lastly via the motivational mechanisms which control our aggressive tendencies, for example a reflex-like response incorporating rational decision making. However, in a study conducted by Archer, Birring and Wu (1998) which focussed on testosterone and aggression in young men it was found that total testosterone and the free androgen index did not correlate with any aggression subscales on an aggression questionnaire. Mazur and Booth (1998) have reported that they share many authors suppositions in that circulating testosterone can directly affect human aggression resulting in a physical violence, although, they do endorse that high or rising testosterone levels encourage dominant behaviours to achieve or maintain higher status.

Carré and McCormick (2008) have reported that male participants who engaged in an aggression related competitive task that their baseline testosterone levels were not associated with aggressive responding. However, they did report that aggressive responding predicted a pre to post task testosterone change; individuals who displayed high responding had the largest testosterone increases. Aggressive responding coupled with a change in testosterone influenced a decision to compete again, whereas males who displayed the highest levels of aggressive responding were more likely to select a non-competitive task. The testosterone-status mismatch

effect has recently received some attention; researchers examined both psychological and physiological consequences of a mismatch between basal testosterone levels and an individual's status. It was found that when a person's preferred level of status matched their actual status they were satisfied, although when a mismatch occurred between preferred and actual status there was a need to regain the desired level. In addition, low testosterone individuals when grouped in to a high status position reported greater emotional arousal and focussed more on their status whereas high testosterone individuals also exhibited this pattern when in a low status position (Josephs, Guinn-Sellers, Newman & Mehta, 2006).

In a review of testosterone and aggression research McAndrew (2009) has stated that literature in this area remains ambiguous although it does suggest that the most common predictor of male human aggression occurs via a public challenge to a man's status through direct competition with another male. This usually occurs as a consequence of insults or from the threat of losing their partner to another male. Furthermore, many studies in behavioural endocrinology are known to focus on how hormones affect behaviour rather than on how behaviour affects hormones (van Anders & Watson, 2006). The authors have also noted that the relationship between testosterone and aggression is complex with causality increasingly hard to establish. Aggression has also been cited as a potential mediator of the home advantage where an analysis of game reports and penalty records in ice hockey games were undertaken; results found that 58.3% of home teams were victorious and a significant interaction between game location and performance existed. In addition, home teams incurred more aggressive game penalties when they won and visiting teams incurred more aggressive penalties when they lost (McGuire, Courneya, Widmeyer & Carron, 1992).

2.6 Overview

The evidence reviewed regarding hormonal literature and responses to exercise appears to be relatively inconsistent, with authors reporting influence of outcome, aggression, anxiety, activity type and territoriality as having an effect on hormone levels (see Table 2.3 for summary

effects). It seems evident that a reciprocal relationship exists between hormonal responses to competition although ambiguity exists between winning and losing effects. The home advantage literature is somewhat more cohesive and remains well established within team sports, with clear contributing factors. However, it become less clear when hormones are integrated, where differences reported in testosterone and cortisol levels in relation to venue have not always produced consistent results.

Drawing upon the identified points that have been made from the review of literature it is apparent that hormonal studies focusing on the effect of venue need to include a greater number of games in order to determine any hormonal patterns in relation to venue type. Studies also need to include a greater range of players not only in terms of age but also in level. In addition, previous literature would also benefit from the perceptual viewpoints of managers and players to determine if they are aware of any prior feelings of territoriality or aggression, which in turn could be indicative of a hormonal change. Studies relating to the perceptions of fans and referees have also been limited and these are two groups of individual's which can also impact heavily on a team's performance. The factors identified have been previously described in the literature as having an integral part in explaining why teams perform better at home than away. From combining a hormonal approach with a multi-perceptual approach it is hoped that a clearer insight can be gained in to the complex mechanisms which comprise the home advantage in football.

Table 2.3: Summary Table Outlining the Effects of Testosterone and Cortisol (increases in the following have been associated with increased levels of the hormones)

Testosterone	Cortisol
Activation and Assertiveness	Psychological Stress
Muscle Metabolic Rate	Physical Stress
Positive Mood	Negative Mood
Cardiovascular Efficiency	Task Anticipation
Aggression	Negative Social Evaluation
Territoriality	Uncontrollability
Dominance	Burnout
Reaction Time	
Spatial Ability	
Attention and Alertness	

Chapter 3

Not On My Turf! Hormones, Territoriality and the Home Advantage in Academy Football

“For John Terry, to die on the pitch would be glory. You would need to kill him - and
maybe even then he'd still play”

Phil Scolari

Chapter 3: Not On My Turf! Hormones, Territoriality and the Home Advantage in Academy Football

3.1 Introduction

The home advantage is globally recognised in virtually all team sports by commentators, bookmakers, players, athletes and managers from a variety of sports including ice hockey, basketball and football (Courneya & Carron, 1992; Nevill & Holder, 1999). It has been conceptually defined by Courneya and Carron (1992) as “the consistent finding that home teams in sports competitions win over 50% of the games played under a balanced home and away schedule” (p.13). This notion has been repeatedly tested with many researchers acknowledging a higher win percentage at home, some examples include 64% winning average in soccer (Pollard, 1986) 54% average in baseball and a 55% average in ice hockey (Pollard & Pollard, 2005a). In American football it was noted that home team’s had significantly higher points, first downs and yards passed gained in comparison to the visiting team (Edwards, 1979).

Many factors have been utilised as an explanation of the home advantage including crowd influences, travel factors, referee bias and venue familiarity (Agnew & Carron, 1994; Courneya & Carron, 1991; Moore & Brylinsky, 1995; Nevill, Balmer & Williams, 2002). A more recent view is that the home advantage occurs as a result of protecting one’s territory. Territoriality has been explored in controlled human environments where Edney (1975) found that male territory residents behaved more dominantly in their own domains irrespective of whether they were allocated control of the task. Furthermore, Taylor and Lanni (1981) found that even an individual who was categorised as having low dominance yielded the most control when in their own room.

This territorial phenomenon is well known throughout the animal kingdom and has been partially explained by the challenge hypothesis. It has been applied to animals such as birds and chimpanzees and has documented their territorial and hormonal responses during the breeding season (Muller & Wrangham, 2004; Wingfield, Hegner, Dufty, & Ball, 1990). The hypothesis

posits that male animals undergo an androgenic response during the breeding season where heightened testosterone levels are associated with aggressive responses. In addition, testosterone levels rise at the start of the breeding season and will further rise during challenges to males that are victorious and decrease in those who have been defeated until the threat subsides and levels return to normal (Archer, 2006; Wingfield, et al., 1990). Studies have previously shown that animals defending their territory are known to attack frequently with enhanced vigour and animals of lesser stature have been known to defeat much larger opponents (Alcock, 1998).

Neave and Wolfson (2003) explored the notion of a hormone mediated territorial response in relation to sporting performance, specifically in football players. They determined that salivary testosterone levels in football players were significantly higher at home opposed to away venues. In addition the authors also noted that players' testosterone levels were significantly higher when playing an extreme rival opposed to a moderate rival. Speculative findings regarding playing position were also noted with strikers exhibiting the highest overall testosterone levels. Defenders who had the lowest training levels had the highest testosterone levels when playing an extreme rival. Carré, et al. (2006) replicated these testosterone findings in elite hockey players, who also exhibited significantly higher levels at home. The authors also found that players' pre-game cortisol levels were higher at home. In addition, Carré and Putnam (2009) have reported again with a group of ice hockey players that watching a previous victory significantly increased testosterone levels as opposed to watching a defeat or a neutral video which resulted in no significant changes.

Research has also documented the physiological responses associated with winning and losing in competitive situations with varying outcomes and conclusions. Elias (1981) found in competitive fighting that winners had higher testosterone and cortisol levels. Higher testosterone levels in winners have been shown to relate to positive mood states in tennis players, whilst cortisol levels were lower in higher seeded players and higher in lower ranking individuals (Booth, Shelley, Mazur, Tharp & Kittock, 1989). It has also been found in competitive fighting that winning and losing did not significantly alter testosterone and cortisol levels; however, the authors stated that the regional team members' testosterone levels increased after competition

whereas those who were not part of the regional team exhibited decreased levels (Salvador, Simón, Suay & Llorens, 1987). In contrast, Suay et al. (1999) found from judo research that an anticipatory rise in testosterone and cortisol was followed by significantly higher cortisol levels in winners than losers. However, this effect was not found for testosterone. In addition, testosterone has been shown to have a well documented physical effect on strength, metabolic and endurance rates, which should have a positive effect for a sports competitor (Bhasin, Storer, Berman, Callegari, Clevenger et al., 1996; Tsai & Sapolsky, 1996).

Varying effects of testosterone and cortisol have been found in males, however research has also found some gender differences with regards to both hormones and competition. Kivlighan, Granger and Booth (2005) studied rowers where results revealed a significant main effect for gender on testosterone, with males displaying higher testosterone levels than women. However, in contrast, women had higher cortisol levels than men which the authors attributed to bonding and social affiliation. Differences were also found in levels of experience where novices displayed a decline in testosterone in the anticipatory phase compared to varsity level rowers. In a competitive video game contest males' testosterone levels remained high over a period of time whereas women's levels dropped. Women also did not show a pre-contest rise whereas their male counterparts did. With regards to cortisol there were also gender differences where women's levels were higher than males and their testosterone and cortisol levels were also highly correlated (Mazur, Susman & Edelbrock, 1997).

There remains some ambiguity over the exact nature of hormones and the subsequent effects of general exercise, competition and non-competitive sport. The following factors create an additional awareness when conducting hormonal research whether it is in general exercise or related to competition. Exercise intensity can alter an individuals' hormonal profile as it is known that acute exercise can elicit an acute response on the adrenal cortex, consequently producing a hormonal response (Sutton, Coleman, Casey & Lazarus, 1973). Furthermore, it is known that different types of exercise for example resistance and endurance can have an effect on hormones (Tremblay, Copeland & Van Helder, 2004). In intercollegiate American football it was found that cortisol levels were significantly higher 15 minutes post-game for starters than

non-starters although no differences were observed for testosterone (Hoffman et al., 2002). Additionally, in a related American football study it was reported that testosterone levels remained at baseline across the season whereas, cortisol levels were significantly reduced between the first day of sampling to the end of a training camp; cortisol levels also remained elevated across the season (Hoffman et al., 2005). This research implies that hormone levels can fluctuate and the levels obtained can be dependent on when hormone sampling occurs in the season. In addition, adding to this hormonal complexity it has been reported that well trained athletes do not encompass homogeneity in their hormonal profiles (Bosco, Tihanyi & Viru, 1996). This further indicates that hormone results may be subject to some individual variation. There is also some ambiguity surrounding the effects of testosterone on cortisol and vice versa with some authors documenting the detrimental effects that one may have on the other (Chichinadze & Chichinadze, 2008; Cumming, Quigley & Yen, 1983). This could also impact on the current experimental study as both hormones will be studied simultaneously.

3.1.1 Study Rationale

The present study aims to extend the findings of Neave and Wolfson (2003) with the addition of the stress hormone cortisol. Research has shown that cortisol can be an important addition when studying the effects of venue (see Carré et al., 2006 for review). It was hypothesised that the independent variable of venue would have an effect on the dependent variables of testosterone and cortisol. In keeping with previous literature it is envisaged that higher testosterone levels should be apparent at home which would coincide with the territorial response mechanism. Additionally, cortisol levels should also be markedly higher at an away venue, due to the unfamiliar setting where football players could feel more apprehensive. It is also hypothesised that an effect will be found regarding two further factors of position and rivalry. It is thought that defenders (including the goalkeeper) would display higher testosterone levels than midfielders and forwards. The present experimental work will also include more games, three at home and three away against three teams of varying rivalry which will be

ascertained by the players and coach. This increase in games and varied rivalry including a major, moderate and minor rival has not been investigated as previous studies have focused on a smaller number of games with only two rival types. From examining additional games and rivals it is also hypothesised that player performance ratings conducted by the coach will reflect any behavioural relationships with hormones.

3.2 Method

3.2.1 Participants

Eighteen male academy football players were originally recruited with prior permission from a Premier League football club. However, due to injury this number was subsequently reduced to fifteen. All players completed an informed consent form and biographical information relating to age and position played. Mean age of participants was 17.47, $SD = .640$ with an average of 10.73, $SD = .961$ years playing football.

3.2.2 Procedure

The study gained ethical approval from the School of Psychology and Sport Sciences Ethics Committee at Northumbria University, UK. Players were asked to produce saliva samples at two training sessions and one hour before three home games and three away games and within 30 minutes post game. Games were selected to include a major rival, moderate rival and minor rival which were ascertained from players' perceptions. Players were asked to rank teams in their league according to perceived rivalry. In addition, the coach was also consulted in order to substantiate the players' rivalry selection. Players tended to cite teams in close geographical proximity to them or those where a competitive history was shared. Performance ratings (see Appendix A) were initially developed specifically for the study. They were then piloted by the coach and fitness coach who were asked to provide their feedback regarding the

measures. The manager and the fitness coach of the team agreed to give performance ratings for the players after each home and away game.

Saliva samples were obtained non-invasively and players were given labelled Salicaps and asked to 'drool' in to them using a straw; they were asked to provide around 5ml of saliva. The game day samples were collected over the course of a season from September to April, with training samples obtained at the beginning and end of this period; all pre-game samples were approximately taken between 10.00 and 11.30 am and post-game samples were approximately taken between 13.00 and 14.00 pm. Training measures were subsequently discarded due to lack of comparability with game measures due to only having one pre-training measure. As a consequence training measures could not be compared to pre-game and post-game measures and were discarded to enhance the studies comparability.

3.2.3 Saliva Sampling

Saliva sampling has been readily proposed as providing a quick and non-invasive biological sampling method (Kirschbaum, Read & Hellhammer, 1993). Saliva has also been frequently used in research to obtain testosterone and cortisol levels. However, it has also been reported that saliva sampling can be somewhat problematic due to its time consuming nature via obtaining the volume of saliva required (Granger, Kivlighan, Fortunato, Harmon, Hibel et al., 2007). The authors have also stated that if sample collection has been inadequate in terms of the volume obtained and assay technicians or protocols cannot analyse a partial sample then missing data could compromise research. However, the authors did note by employing a passive drool method that these issues could be addressed namely; it enables a large volume of saliva to be collected; minimises the utilisation of substances to stimulate salivary flow e.g. sugarless gum; provides a sample that can be used to measure additional hormones and allows for the unused sample to be frozen in accordance with protocols.

Dabbs (1990) has extensively researched salivary testosterone and its subsequent reliability; four studies were conducted with male and female participants ranging from thirty

minutes to eight weeks apart. The participants then collected samples on at least two days; awakening, midmorning, late afternoon and late evening. He reported that mean testosterone concentration declined by 50% from morning to evening in both genders and overall reliability declined from $r = .64$ across two days to $r = .52$ across seven to eight weeks. Dabbs (1991) has further reported that saliva sampling in testosterone provides the free, biologically active portion of testosterone and that participants are willing to provide saliva more freely than with serum sampling. He has extended his earlier findings by examining the implications of collecting and storing saliva samples; concluding that using cotton dental rolls can lead to inflated testosterone levels. In addition he has also reported that leaving unpreserved i.e. unrefrigerated samples at room temperature or mailing them is satisfactory for male participants but this is not the case for female participants. Shirtcliff, Granger and Likos (2002) have reported that salivary testosterone levels irrespective of assay method correlated more strongly with serum total levels than serum free levels.

Using saliva samples to measure cortisol has also received strong recommendations; Kirschbaum and Hellhammer (1994) have stated that cortisol can be measured under a variety of clinical and field settings to almost unlimited frequency. In addition, the authors have reported that due to cortisol entering saliva by passive diffusion or means independent of an active transport mechanism then, saliva flow rate does not impact upon salivary cortisol levels. Aardal and Holm (1995) reported in their study that salivary cortisol samples were stable for at least seven days at room temperature and for nine months stored at -20°C . The authors also noted that salivary sampling had satisfactory precision and encouraged its use in situations when blood sampling is difficult. In support, Lippi, De Vita, Salvagno, Gelati, Montagnana et al. (2009) examined the relationship between morning salivary and serum cortisol levels in athletes and reported a highly significant correlation between them thus, indicating the robustness of salivary sampling.

Overall, the above review provides a rationale outlining the utilisation of a salivary sampling methodology. The evidence has provided consistent reliability and validity in line with

serum sampling, thus highlighting the robustness of salivary sampling as an appropriate method in the current experimental work.

3.2.4 Hormone Analysis

Testosterone and cortisol assay kits were supplied by IBL Hamburg, Flughafenstrasse 52a, D-22335 Hamburg, Germany and were analysed using a luminescence immunoassay kit, which is based on the competition principle. Samples were collected in labelled Salicaps which were then stored in a Salicap box and frozen. They were stored in a -20°C tissue bank which meets specifications outlined in the Human Tissue Act (HTA). When samples were ready for analysis they were then thawed and centrifuged in the School of Psychology and Sport Sciences specialist laboratory. Each hormone was then analysed according to the specific recommendations associated with the assay kit. Luminescence immunoassays were conducted for both hormones and analysis is based on the competition principle which has been outlined in guidelines formulated by IBL International (2008) “An unknown amount of antigen present in the sample and a fixed amount of enzyme labelled antigen compete for the binding sites of the antibodies coated onto the wells. After incubation the wells are washed to stop the competition reaction. After the addition of the luminescence substrate solution, the intensity of the luminescence measured is inversely proportional to the amount of the antigen in the sample” (p2). Sample results can then be determined using the known standard curve. Saliva samples in the current experimental work were assayed using separate kits on separate days due to the amount of assays that had to be conducted; assay kits can only account for 78 samples per kit.

3.2.5 Cortisol Analysis

An unknown amount of cortisol which is present in the sample and a fixed amount of enzyme labelled antigen (cortisol conjugated to Horseradish Peroxidase) compete for the binding sites of the anti-cortisol antibodies (rabbit) coated onto the wells of the microtiter plate. Samples

are then incubated for approximately three hours where the wells were then washed to finalise any further competition reaction. Luminescence substrate solution was added and luminescence was measured using a Bio-Tek FLx800-TBI Microplate reader with KC4 Data Analysis Software supplied by Labtech International Ltd, Acorn House, The Broyle, Ringmer, East Sussex, BN8 5NN. The inter assay coefficient of variation for cortisol assays were between 2.1 % and 4.1% and the intra assay coefficient of variations were between 3.1% and 3.4% again as specified by the kit provider IBL.

3.2.6 Testosterone Analysis

The wells of the microtiter plate are coated with a rabbit anti-mouse antibody. A known amount of mouse anti-testosterone antibody binds to the antibodies coated on the wells. An unknown amount of testosterone present in the sample and a fixed amount of enzyme labelled antigen (testosterone conjugated to alkaline phosphatase) compete for the binding sites of the mouse anti-testosterone antibody. Samples were then incubated for approximately four hours which occurs on an orbital shaker (400-600 rpm). The wells were then washed to stop the competition reaction. Luminescence substrate solution is then added and luminescence is measured using a Bio-Tek FLx800-TBI Microplate reader with KC4 Data Analysis Software supplied by Labtech International Ltd, Acorn House, The Broyle, Ringmer, East Sussex, BN8 5NN. The inter and intra assay coefficient of variation for testosterone kits as specified by IBL were between 3.76%- 6.96% and 1.47%-3.24% respectively.

3.3 Results

3.3.1 Testosterone

A 2x2 repeated measures ANOVA was conducted for testosterone levels (pre, post) by venue (home, away) and revealed no main effects and no interaction. Although the results were

non-significant it should be noted that pre-measures of testosterone at home and away remained constant and were highly correlated ($r = .81$, $df = 14$, $p = .001$).

Positional effects were also studied and a $2 \times 2 \times 3$ repeated measures ANOVA was conducted for time (pre, post) by venue (home, away) by position (defender, midfielder, forward). Results revealed a significant interaction (see Figure 3.1) between time and playing position ($F_{2,12} = 5.314$, $p = .022$). Post hoc analysis adjusted using the Bonferonni correction revealed no differences between the positions; this was possibly due to the low number of participants included in each group. However, mean results revealed that the biggest differences were observed pre-game at home between the defenders ($M = 196.78$ pg/mL) and the other two groups {midfielders ($M = 106.34$ pg/mL) and forwards ($M = 104.63$ pg/mL)}. Means and standard deviations (SD) are also presented in Table 3.1. A further ANOVA was conducted for rivalry and no differences were found.

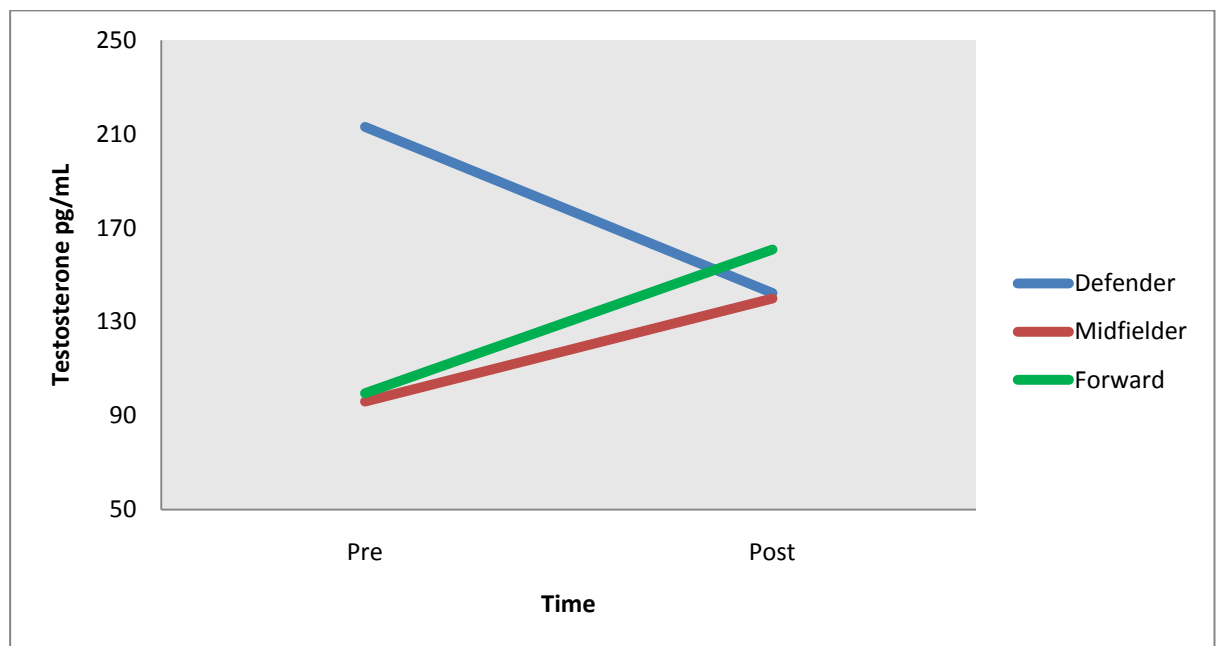


Figure 3.1: Testosterone levels by playing position

Table 3.1: Mean (SD) for testosterone values (venue x time x position)

Position	Venue	Time	Mean (SD) pg/mL
Defender (N=5)	Home	Pre	213.00 (90.89)
	Home	Post	142.31 (34.74)
	Away	Pre	180.56 (100.31)
	Away	Post	163.02 (148.37)
Midfielder (N=7)	Home	Pre	96.07 (50.99)
	Home	Post	139.88 (64.10)
	Away	Pre	116.60 (16.98)
	Away	Post	86.37 (28.08)
Forward (N=3)	Home	Pre	99.61 (78.60)
	Home	Post	160.75 (27.98)
	Away	Pre	109.65 (30.40)
	Away	Post	95.38 (32.96)

3.3.2 Cortisol

A 2x2 repeated measures ANOVA (see Figure 3.2) was computed for venue (home, away) by time (pre, post). Results revealed a significant main effect of venue on cortisol levels ($F_{1,14} = 6.77$, $p = .021$), with higher levels for home ($M = 13.32$ nmol/L) than away ($M = 9.90$ nmol/L). There was also a main effect for time ($F_{1,14} = 14.07$, $p = .002$), with pre-match levels significantly lower ($M = 9.06$ nmol/L) than post-match levels ($M = 14.16$ nmol/L). Finally there was also a significant two-way interaction between venue and time on cortisol levels ($F_{1,14} = 12.706$, $p = .003$). Paired sample t-tests were subsequently conducted to determine post hoc comparisons where a Bonferroni correction was applied. Post hoc t-tests revealed a significant difference ($t = -5.16$, $df = 14$, $p = .000$) between pre-game ($M = 7.84$ nmol/L) and post-game cortisol levels ($M = 18.80$ nmol/L) at home, and there was also a significant difference ($t = 3.52$, $df = 14$, $p = .003$) between post-home ($M = 18.80$ nmol/L) and post-away

(M = 9.51 nmol/L) game. There were no positional or rivalry differences for cortisol at home and away venues. Mean (SD) are also provided in Table 3.2.

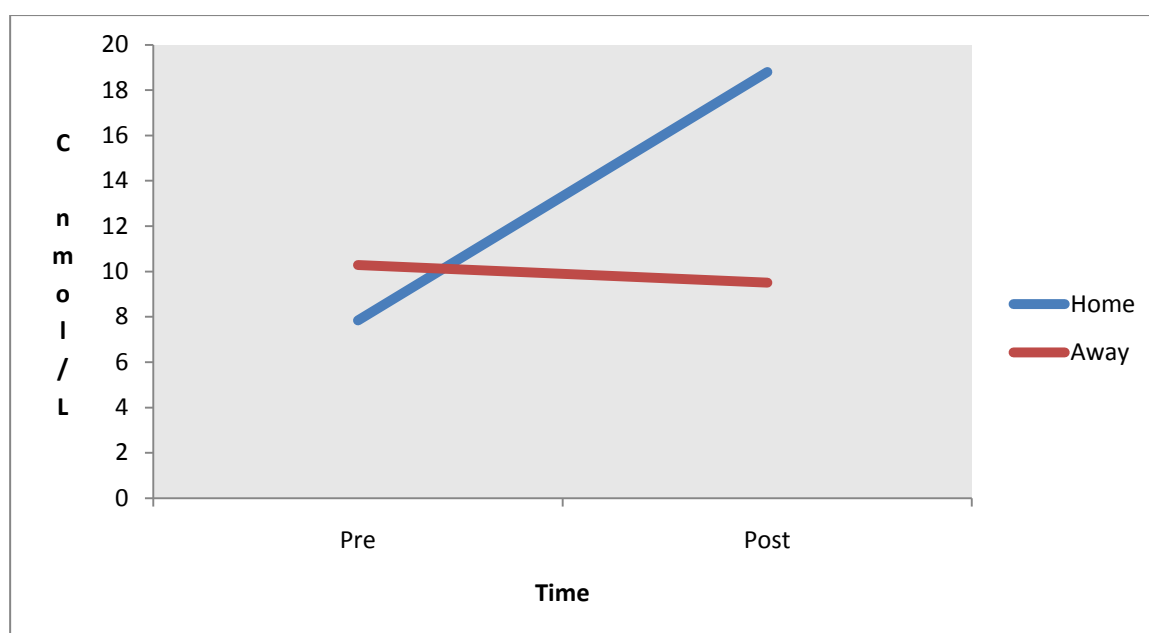


Figure 3.2: Interaction showing an effect of venue (home vs away) against time (pre vs post) for cortisol

Table 3.2: Mean (SD) for cortisol values (venue x time)

Venue	Time	Mean (SD) nmol/L
Home	Pre	7.84 (4.15)
Home	Post	18.80 (8.16)
Away	Pre	10.28 (5.13)
Away	Post	9.51 (7.90)

3.3.3 Coach Ratings

The manager and fitness coach of the academy team rated the overall performance of their players for each game. Although there were no correlations observed between hormones and coach ratings, there was, however, high inter-rater reliability found between the manager and fitness coach for most items ($p < .05$). Disagreement occurred on shooting, all goalkeeper

items and also on overall mental performance. A two-way ANOVA (home v away by manager v coach) revealed that the manager scored players more positively ($M = 4.54$) than the fitness coach ($M = 3.79$) at home, while for the away, the manager scored players more negatively ($M = 3.89$) than the fitness coach ($M = 4.82$) ($F_{1,16} = 542.62, p = .000$).

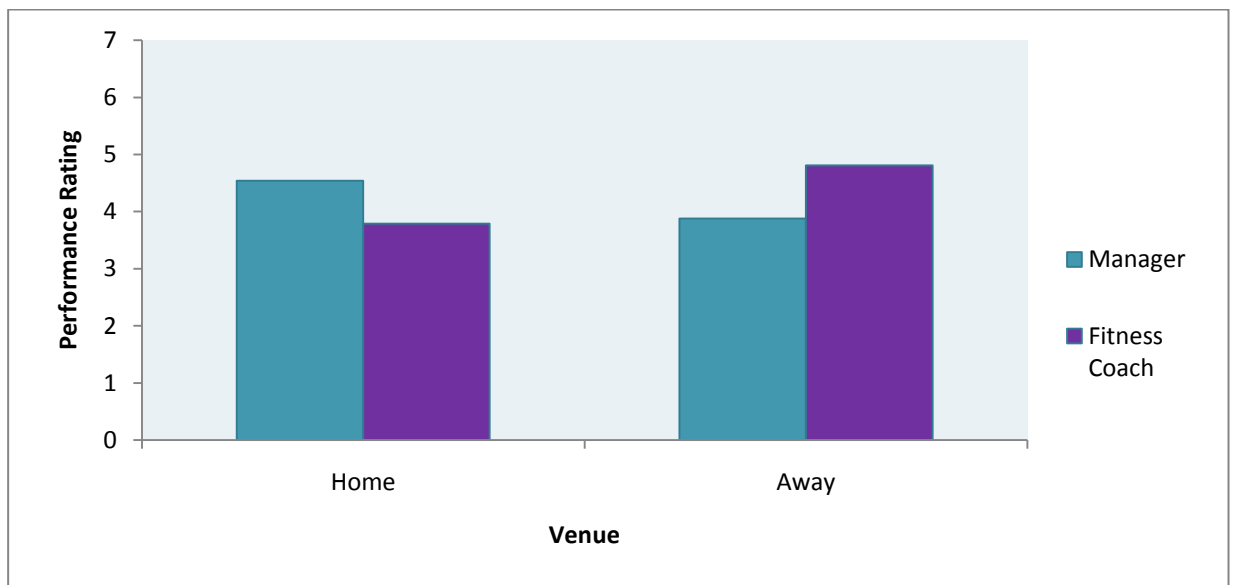


Figure 3.3: Player ratings conducted by coaches for home and away performance

3.4 Discussion

The aim of this study was to examine the possible effects of home and away venues on hormone levels specifically testosterone and cortisol in male academy football players. The study also aimed to determine any further relationships between hormone levels and overall playing performance as rated by the academy manager and fitness coach. Contrary to the trend of recent testosterone research, the current study found no significant differences between testosterone levels irrespective of venue (playing at home or away). This is in contrast to the findings of Neave and Wolfson (2003) who found a significant pre-match rise in testosterone before a home game as compared to an away game and training session. It is also inconsistent with the findings of Carré et al. (2006) who found that players had significantly higher pre-game testosterone levels at home compared to away. However, the authors in contrast to previous

findings determined by Neave and Wolfson (2003) noted that this was not due to a pre-game rise whilst competing at home but rather a decrease when playing away. Although no overall differences were found in terms of venue for testosterone, there was a significant interaction between time and playing position. Mean results revealed that the biggest differences were observed pre-game at home between the defenders and the other two groups comprising midfielders and forwards. This positional phenomenon has been alluded to previously by Neave and Wolfson (2003) who noted that while forwards had higher levels across both venues, goalkeepers and defenders had the lowest testosterone levels in training but exhibited the largest increase in testosterone levels, particularly when playing against an extreme rival.

The cortisol results obtained in the current study with a significantly higher post-game rise at home are consistent with the findings of Elias (1981) who also reported that cortisol levels in wrestlers rose consistently from pre-competition to post-competition, and remained elevated during the final sampling which was 35 minutes post-game. It should be noted that in the current study cortisol levels were examined before and after home and away games whereas, Elias (1981) only took one measure from a single exercise bout. Elias also reported that winners showed greater pre-game and post-game values than losers, whereas in the current study the team selected won every game. This may partially explain the post-game increase in cortisol levels at home. However, it does not explain the post-match decline in levels away from home as the game outcomes were consistent. Previous research has found hormonal differences for cortisol in male football players; with higher cortisol levels evident prior to match commencement when compared to training (Alix-Sy, Le Scanff & Filaire, 2008). In comparison, female soccer players have been reported to have increased cortisol levels post-game for starters (+250%) and for non-starters (+140%) training levels however, did not significantly change (Haneishi, Fry, Moore, Schilling, Li et al., 2007). It has also been found that in male football players serum testosterone levels had a positive correlation with maximal running speed and explosive power but shared a negative correlation with endurance evaluation (Bosco, Tihanyi & Viru, 1996).

A further football study conducted by Edwards, Wetzel and Wyner (2006) and a rowing study conducted by Kivlighan, Granger and Booth (2005) support the current experimental findings, reporting post-game cortisol levels in male participants were significantly higher than before game. Hoffman et al. (2002) also found significantly higher post-game cortisol levels in American football starters which the authors attributed the elevation to stress, diet, inflammation and exercise intensity; although they did not allude to venue in their analyses.

As in previous research, many authors have investigated the relationships between hormones and winning and losing with differing conclusions (Booth et al., 1989; Gladue, Boechler & McCaul, 1989; Salvador et al., 1987; Suay et al., 1999). In addition, Carré (2009) reported that home victories lead to a greater testosterone rise compared to away victories in elite ice hockey players. These results could not be replicated in the present study as the team that was selected was on a winning streak when samples were being collected. There were no differences between testosterone levels irrespective of venue, and higher testosterone levels after a home victory were also not substantiated.

The issue of a winning streak is a factor that has rarely been encountered in previous literature; indeed it is not known of any study which has previously found this. One possible explanation of why no differences were found for testosterone on venue could be the notion of momentum within a game which has been defined as “the force that dictates the flow of a match” (Higham, Harwood & Cale, 2005 p 5). The authors have further stated that if players can learn to control momentum within a game and create it for themselves they may be able to achieve a desired result, score goals and concede less. In addition, Vergin (2000) has reported that a belief exists amongst the sporting fraternity that momentum can provide an important force in competitive situations; terminology used to describe these forces are regularly heard and include the ‘hot hand’ in basketball and winning and losing streaks in team sports.

As well as momentum within the game the concept of psychological momentum also exists; psychological momentum has been defined as psychological power which has been added or gained and can help performers believe that they have an edge over the opposition (Iso-Ahola & Mobily, 1980). Moreover, psychological momentum has been stated to be somewhat elusive

in nature specifically as to how it can contribute to enhanced performance from a psychological standpoint (Crust & Nesti, 2006). Perreault, Vallerand, Montgomery and Provencher (1998) found that when participants lost the lead in a bogus cycle race their perceptions of psychological momentum decreased significantly, whereas when participants regained the lead their perception of psychological momentum significantly increased. The authors further noted that experiencing psychological momentum also led to increased performance however, losing psychological momentum also led to improved performance. It has also been found that athletes that have reached the greatest heights in their sport are known as a consequence to gain additional demands required from them; approximately a third of the athletes reported in the study continued to cope with the additional demands and continued to win. However, those who did not cope either failed to win again or took a greater time in doing so (Kreiner-Phillips & Orlick, 1993). In the present study, academy players who showed promise or played well could be selected to play additional games for the reserve team or even the first team, which meant playing extra mid-week games. Jones and Harwood (2008) studied perceptions of psychological momentum in football players and reported that a trigger of positive momentum was confidence whilst low confidence triggered negative momentum. This can be partially related to the current study as the team was on a winning streak and although no psychological measures were taken from players it can be inferred that a team on a winning streak, at the top of the league table and having a cup run should be high in confidence. In additional studies psychological measures should be taken prior to game commencement in order to ascertain a player's confidence level and whether there are any hormonal relationships between opponents. In contrast to previous research studies the coach ratings obtained in the present study were not related to the player's hormone levels. However, it was interesting to note that at home the manager scored players more highly for performance than the fitness coach, whereas away from home the manager scored players lower than the fitness coach. This suggests that the manager may tend to view his players more favourably at home and is more critical away from home. However, it should be that the performance measure in the current study has potential limitations namely its validity and reliability. The questions were developed in relation with the coach and fitness coach in

order to reflect the more commonly known performance variables in football. The measures were developed this way due to the lack of performance measure questionnaires currently available. It could be that future research could utilise standardised performance measures such as ProZone in order to obtain more robust performance data.

In the current study some of the more popular explanations associated with the home advantage such as travel and crowd factors can be eliminated as the distance travelled by the team was minimal, largest travelling distance was around two hours and the crowd sizes at each game comprised less than 200 supporters. This is in keeping with the study conducted by Neave and Wolfson (2003) who also studied a similar participant group. Referee bias could also be partially discounted as the team utilised has strict rules which forbid supporters to chant or question any decisions that the referee may make, instead supporters are encouraged to observe the rules, applaud and act supportively. One variable which could have impacted on the player's stress levels which in turn could have caused a greater rise in cortisol levels is that the majority of supporters that watch home games are the players' parents and family. The effect that this may have on the players is unknown and it should also be noted that family members can also travel to away games and give their support. Familiarity, however, could still provide a viable explanation in the current study as the academy players train at the venue as well as play competitive games there. Neave and Wolfson (2003) have also commented that when playing at home players can orient themselves better due to increased spatial awareness stemming from familiar visual cues. Coaches have also been known to cite familiarity as the major contributor of the home advantage (Gayton, Broida & Elgee, 2001).

A possible limitation in the current study concerns the baseline training measures taken; only one training sample was obtained and it occurred after the player's had trained. The baseline results were examined but it was deemed necessary to omit the values as they were confounded by the players training where a hormonal rise would have already have occurred. In hindsight pre-training and post-training measures should have been taken in order to be consistent with the game measures. Thus, in this study only the game values have been reported as these were taken both pre-game and post-game. Another possible confound as mentioned

earlier concerns the results of the games, the team that we studied were on a winning streak and won every game that we studied, this may have inadvertently affected the hormonal results obtained as it is well known that a winning effect can increase hormones which could have possibly lead to a hormonal plateau.

3.5 Conclusion

In summary, the present results partially support some of the hormonal findings that pertain to the home advantage. However, it also identifies the potential role of cortisol in the home advantage. The study has highlighted the need to extensively investigate the role of hormones in the home advantage, and how these hormones are affected by playing at particular venues. The research also adds a unique element to previously conducted research whereby cortisol levels are higher post-game irrespective of rival types (extreme, moderate and minor rival). Although no differences were found for testosterone and venue, there were positional differences evident. This can be interpreted as a potential indicator of territoriality as defenders which included the goalkeeper had higher pre-game testosterone levels prior to playing at home, this is an area which needs further clarification.

It could also be argued from the current results that the role of testosterone and cortisol add further ambiguity to the home advantage and that a greater effort is needed to ascertain the exact effects of venue on these hormones. The exact effects of both hormones especially testosterone were difficult to determine due to the unique winning effect that occurred with game outcomes. The current study highlights the need for further research to examine physiological and psychological variables associated with the home advantage.

Chapter 4

The Home Guards:

Testosterone and Cortisol Responses to Playing Venue in Male Football

Players

“They munched on a lamb.... I'd have liked us to be lions, but unfortunately we had a
bit of mint sauce on ourselves”

Ian Holloway

Chapter 4: The Home Guards: Testosterone and Cortisol Responses to Playing Venue in Male Football Players

4.1 Introduction

Chapter 4 aims to replicate and extend the findings outlined in Chapter 3 utilising a different population in football. The players recruited for this next study play approximately two games per week, are older, and play in arguably a more physical league than the players in the previous chapter. In addition, compared to the previous study experimental procedures have been made more robust and hormonal training measures will be taken pre and post in keeping with the game measures. Players will also be asked to rate how they feel prior to game kick off; this is to determine whether the hormonal changes with specific regard to the cortisol findings in the previous chapter can be explained by feelings of anxiety or worry. It is also hoped that the team studied in the present chapter will provide a mixture of game results as in their previous season they finished around mid-table; this will hopefully eradicate the winning streak phenomenon that occurred in Chapter 3.

The home advantage is known to encompass many factors, and a home venue has been said to act as an umbrella from which many mechanisms can operate under (see Courneya & Carron, 1992 for review). Since the publication of Neave and Wolfson's (2003) paper outlining the effects of venue on testosterone there has been a growing literature base in the area, with Carré et al. (2006) reporting similar findings in elite ice hockey players; they noted that players' testosterone levels were higher at home as opposed to away but were not attributed to a pre-game rise at home: instead it was noted that testosterone levels declined away from home. In addition to studying testosterone responses the authors also focussed on the stress hormone cortisol and noted that pre-game cortisol levels tended to be higher at home. More recently, Carré (2009) documented that at home, post-game testosterone levels resulted in a significantly greater testosterone rise than was found at an away venue.

Hormonal differences in relation to venue have been attributed and explained using theories of territoriality which are prevalent in animal literature. The notion of a territorial response in animals in relation to behavioural and hormonal responses has unearthed pertinent findings with authors acknowledging that male testosterone levels correlate with aggressive responses during socially unstable periods (see Archer, 1988; 2006 for review). One model that has been pertinent in offering an explanation for hormone mediated behavioural responses is Wingfield et al's (1990) Challenge Hypothesis (see Chapter 2 for full explanation) which aimed to account for the testosterone-aggression relationships in monogamous birds. Testosterone levels were reported to rise prior to the breeding season and continue to rise during social challenges resulting in aggression facilitation during mate-guarding, territorial defence and dominance issues (Wingfield & Kitaysky, 2000). Wingfield and Wada (1989) have also reported that an invasion of an animal's perceived territory can subsequently result in a rise in testosterone.

There has been some attempt to relate these animal findings to humans, although this has proved difficult (see Archer 2006 for review). Archer, Birring and Wu (1998) aimed to discover if there was a relationship between aggression and testosterone levels in males; however, they did not unearth any significant relationships between the two variables. In a domino contest Wagner, Flinn and England (2002) reported that testosterone and cortisol levels were higher between individuals from two rival villages rather than within individuals from one particular village alluding to a territorial response. More recently, Oxford, Ponzi and Geary (2009) studied testosterone levels in males who had competed in a within and between group video game competition. The authors reported that males who contributed the most to their teams' between group victory displayed an immediate testosterone increase, but only if this occurred before the within group competition. In contrast, high scoring males on the losing side did not show an immediate effect, but they did display a delayed increase. Overall, higher ranking males had lower testosterone and higher cortisol levels during the within group contest. The authors have concluded that their results are consistent with the hypothesis that testosterone responses are dependent on in group and out group competition.

Territoriality in a sporting context has received little attention; however, it has been reported in ice hockey players that when playing at home they reported increased feelings of arousal and aggression (McGuire, Courneya, Widmeyer & Carron, 1992). Cortisol can also provide a valuable addition when studying territorial and hormone mediated behavioural responses; it provides an additional facet by examining stress levels associated with a particular task. Tsigos and Chrousos (2002) have reported that homeostasis can be constantly challenged by a variety of intrinsic and extrinsic factors which can result in adverse affects. The authors further report that in pleasant favourable conditions individuals can enhance their emotional and intellectual growth; however, under unfavourable conditions or during situations of perceived threat an individual's stress response mechanism (see Chapter 2 for full review) will become activated and disrupt the homeostatic balance. In addition, Sapolsky (1994) has stated that in a social hierarchy where social dominance leads to attendant psychological rewards, further facilitates a more adaptive stress response. He has also reiterated that subordinates within a dominance hierarchy are subjected to having the most stressful lives which not only occur as a consequence of defeat and receiving physical aggression but also from a more psychological standpoint.

Sporting competitions have been reported to provide the most comparable medium to examine the hormone-behaviour response to a social challenge in humans (Archer, 2006). Competitive fighting has been used as a medium to explain such challenges and has provided somewhat fruitful results in supporting the notion of a hormonal response as a consequence of a challenge. In early research, Elias (1981) noted that male winners in a wrestling contest exhibited greater changes in testosterone than losers and that cortisol levels remained elevated post-contest, with winners having higher levels than losers. Salvador et al. (2003) also noted an adaptive psychobiological response in judo competitors whereby a competitive situation elicited elevated anticipatory cortisol levels; there were no anticipatory testosterone differences although some individual differences were reported regarding testosterone and motivation to win. Filaire et al. (2001) also reported this anticipatory rise in cortisol levels pre-judo competition, and documented that testosterone levels after the last fight were significantly higher in losers than

winners. Hormonal findings, however, were not correlated to any of the psychological variables in relation to competition outcome.

Although there have been noticeable differences in hormonal responses for both testosterone and cortisol for competitive encounters there still remains some ambiguity, with Gonzalez-Bono et al. (1999) reporting no overall hormonal responses in relation to competitive basketball for either testosterone or cortisol. The authors did specify, however that cortisol levels increased in both winners and losers, with losers also significantly presenting higher testosterone levels. Elloumi et al. (2003) have reported in rugby players that throughout competition cortisol levels sharply increased and returned to baseline within four hours post game whereas testosterone levels had decreased slightly. In addition, during periods of recovery cortisol levels were lower and testosterone higher than baseline measures resulting in a high testosterone/cortisol ratio which the authors attributed to re-balance homeostasis. Testosterone and cortisol levels in female rugby players have been reported to increase 24 hours prior to a game and continue to rise during the game irrespective of win or loss (Bateup et al., 2002). Oliveira, Gouveia and Oliveira (2009) have also examined hormonal responses in football with reporting that female participants displayed an anticipatory rise in both testosterone and cortisol levels. Edwards, Wetzel and Wyner (2006) have also reported a substantial testosterone and cortisol increase in competitive games for both male and female players. However, it should be noted male testosterone levels were not statistically significant.

4.1.1 Study Rationale

This study aims to address some of the ambiguity found in the literature regarding the effects that testosterone and cortisol can exert on behaviour. This study examines both hormones simultaneously and combines physiological and psychological measures within competitive sport. It was hypothesised in relation to previous literature that a home venue would elicit the strongest hormonal response for testosterone, previously linked to territorial dominance at home. Furthermore, it was hypothesised that differences would occur between venue (independent variable) and the two additional factors of rivalry and position. These two factors have been

included by previous researchers and have been linked to territoriality, dominance and Wingfield's (1990) Challenge Hypothesis.

4.2 Method

4.2.1 Participants

Twenty male Blue Square North football players were originally recruited with prior permission from their club. However, in this league players can be transferred and loaned at any time during the season and resulting from this and injuries sustained 12 players could be included in the analysis. All players completed an informed consent form and biographical information relating to age and position played. Mean age of participants was 23.17, SD = 3.83 years.

4.2.2 Procedure

The study gained ethical approval from the School of Psychology and Sports Science Ethics Committee at Northumbria University, UK. Players were asked to produce saliva samples before and after a training session and also one hour before two home games and two away games and within 30 minutes post-game. Games were selected to include an extreme rival and a moderate rival, perceptions of rivalry were ascertained from the players and this was then substantiated by the physiotherapist of the team who was also an ex-player. As in the previous chapter, saliva samples were obtained non-invasively. Players were assigned a participant number and were given labelled Salicaps corresponding to their assigned number. They were then asked to 'drool' in to them using a straw, they were asked to provide around 5ml of saliva. The game day samples were collected from October to April, with training samples obtained at the end of this period due to a fixture back log. The fixture for the moderate rival occurred on Tuesday evenings for both home and away games and kick off was at 7:45pm. Samples were taken approximately one hour prior to kick off. The fixture for the extreme rival occurred in

December with both home and away games taking place in this month and the kick off for this fixture was at 3.00pm for both games; again samples were taken approximately one hour prior to kick off and post-game measures were collected within approximately 30 minutes after game finish.

4.2.3 Pre-Game Questionnaire

The STAI-6 questionnaire which encompassed a six item short form of Spielberger's State Anxiety Questionnaire (Marteau & Bekker, 1992 see Appendix B) was administered pre-game for all games (approx 1 hour prior to kick off). The authors of the short form questionnaire have highlighted the impractical nature of Spielberger's original questionnaire in a field setting due to it comprising 40 items. Marteau and Bekker (1992) have stated a Cronbach's α of .82 for the reliability of the six-item questionnaire which was in line with the original 20 item scale. In addition the authors have measured the concurrent validity of the questionnaire for the six item version and have reported that there were no differences between mean scores obtained using the full form of the State-Trait Anxiety Inventory and the short form version. Sensitivity of the STAI-6 questionnaire was also explored and it was reported that it was sufficiently sensitive to detect changes in anxiety across groups with both normal and raised levels of anxiety.

The STAI-6 asked participants to rate themselves on how they felt right at that moment on a 4 point Likert scale (1 = not at all, 2 = somewhat, 3= moderately, 4 = very much) for a series of statements (I feel calm; I feel tense; I am upset; I feel relaxed; I feel content and I am worried). The questions contained in the STAI-6 were then followed by a series of additional statements on a six point Likert scale (1-2 less than usual, 3-4 same as usual, 5-6 more than usual) which asked participants how they felt compared to their usual self and the statement was followed with five adjectives (comprising aggressive, confident, anxious, focussed and effective). These questions were included to act as a buffer to the STAI-6 and divert specific attention away from the main pre-game questionnaire focus.

4.2.4 Hormone Analysis

Testosterone and cortisol assay kits were analysed using a luminescence immunoassay kit supplied by IBL Hamburg, Flughafenstrasse 52a, D-22335 Hamburg, Germany. Samples were collected in labelled Salicaps which were then stored in a Salicap box and frozen. They were stored in a designated -20°C tissue bank approved by the HTA. Each hormone was then analysed according to the specific recommendations associated with the assay kit and the exact methodology used has been outlined in Chapter 3.

4.3 Results

4.3.1 Testosterone

Due to sample contamination (blood) and player injury there were some missing cases in the data file. As a result hormone results had to be averaged with mean values taken in order for general home versus away comparisons to be undertaken. This resulted in the use of one overall home measure and one overall away measure for both hormones.

A 3x2x2 repeated measures ANOVA for testosterone was computed for venue (training, home, away) by position (defence, offence) by time (pre, post). Results revealed no main effects for venue and time although there was a significant (see Figure 5.1) two-way interaction ($F_{2,22} = 4.374$, $p = .027$). Paired sample t-tests using the Bonferonni correction revealed significant differences at home between pre-game and post-game ($t = -3.109$, $df = 11$, $p = .020$) but no statistical differences were found for training or away games. However, there was also a marginal three-way interaction (see Figure 5.1) between position, venue and time ($F_{2,20} = 3.30$, $p = .058$). Post hoc t-tests were further conducted using the Bonferonni correction, where results indicated that statistical differences occurred for testosterone ($t = -3.793$, $df = 4$, $p = .038$) at home between pre-game ($M = 66.74$ pg/mL) and post-game ($M = 105.18$ pg/mL) in the defensive players. There were no statistical differences observed for training or away

games. A repeated measure ANOVA was also conducted for venue (home, away) by time (pre, post) by rival (major, moderate) and there were no statistical differences.

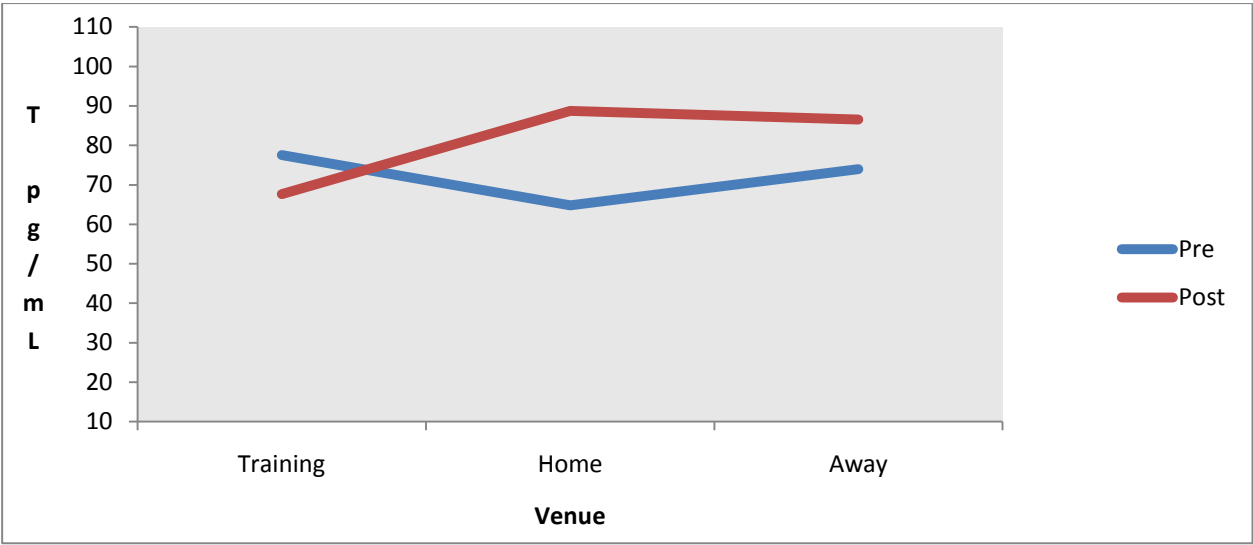


Figure 4.1: Venue by time interaction for testosterone

Table 4.1: Testosterone Means (SD) for venue x time (pg/mL)

	Training (pg/mL)	Home (pg/mL)	Away (pg/mL)
Pre	77.52 (32.18)	64.84 (22.05)	74.01 (44.70)
Post	67.62 (30.39)	88.75 (30.85)	86.59 (33.14)

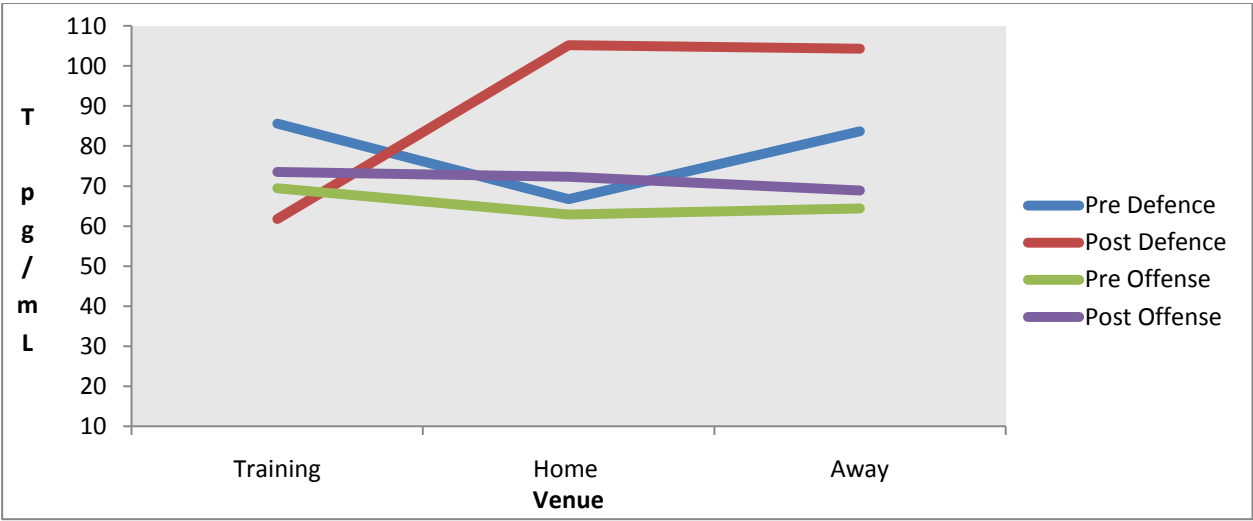


Figure 4.2: Position by venue by time marginal interaction for testosterone

Table 4.2: Testosterone Means (SD) for venue by time by position

N=12	Train Pre (T pg/mL)	Train Post (T pg/mL)	Home Pre (T pg/mL)	Home Post (T pg/mL)	Away Pre (T pg/mL)	Away Post (T pg/mL)
Defence	85.61 (47.26)	61.74 (43.85)	66.75 (8.49)	105.19 (18.10)	83.64 (39.18)	104.32 (18.58)
Offence	69.42 (16.78)	73.49 (18.56)	62.93 (28.91)	72.31 (31.64)	64.38 (49.59)	68.86 (34.23)

4.3.2 Cortisol

A 3x2 repeated measures ANOVA for cortisol was computed for venue (training, home, away) by time (pre, post). In keeping with the testosterone results, averaged values were utilised due to the small participant number in individual game analyses. It should be noted that one player had a contaminated sample and was thus removed from the cortisol analysis, leaving only 11 players. Results revealed no main effects for venue; however, there was a main effect for time ($F_{1,10} = 4.941$, $p=.050$) with post-game levels ($M = 5.73$ nmol/L) higher than pre-game levels ($M = 3.28$ nmol/L). There was also a significant two-way interaction (see Figure 5.3) for venue and time ($F_{2,20} = 9.559$, $p=.001$). Post hoc t-tests adjusted using the Bonferonni correction revealed a significant difference at home ($t = -3.979$, $df = 10$, $p = .006$) between pre-game (2.55 nmol/L) and post-game (8.36 nmol/L). No differences were found for training or away games.

Analyses were also conducted to examine any positional differences. However, this did not yield any significant results. Cortisol is also known to display a pronounced diurnal pattern, with elevated levels immediately upon waking which continuously decline throughout the day leading to nadir in the evening (Kudielka et al., 2004). Due to games taking place at different times of day (3pm and 7:45pm) paired sample t-tests were conducted between the samples to determine any differences; analyses revealed no differences between the samples.

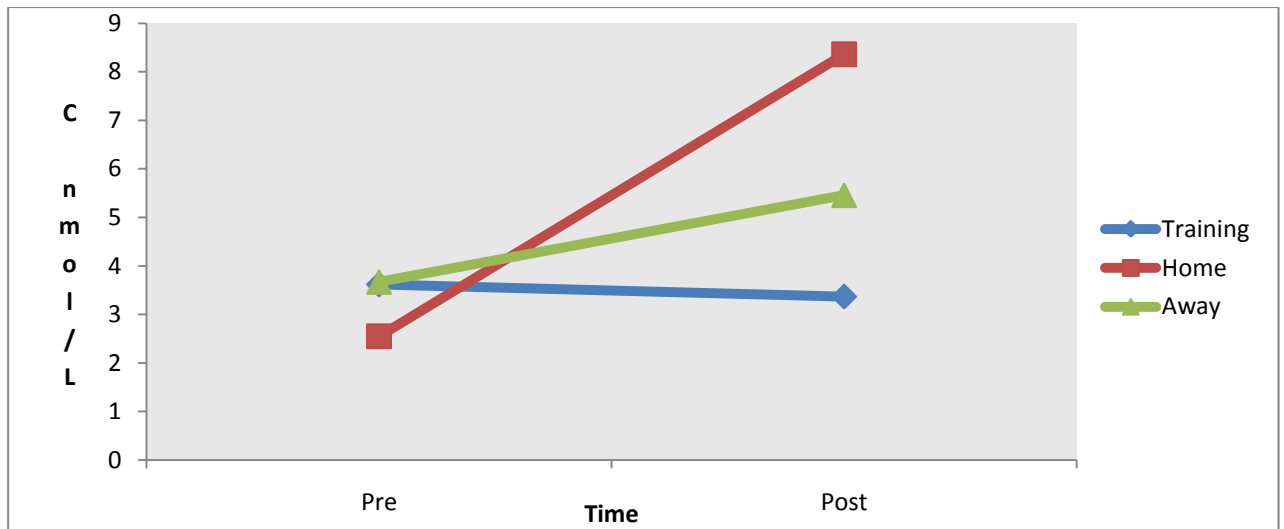


Figure 4.3: Cortisol levels (venue x time)

Table 4.3: Mean Values (SD) for cortisol (venue x time)

Venue	Time	Mean (SD) nmol/L
Training	pre	3.62 (3.15)
	post	3.37 (3.81)
Home	pre	2.55 (1.28)
	post	8.36 (5.31)
Away	pre	3.67 (2.57)
	post	5.46 (3.49)

A 2x2x2 repeated measures ANOVA revealed no main effects for rival (major rival, minor rival), venue (home, away) or time (pre, post) ($n=5$) although there was a significant three-way interaction ($F_{1,4} = 18.27$, $p = .013$). Post hoc paired sample t-tests were conducted on the data and revealed a marginal difference ($t = -2.29$, $df = 4$, $p = .08$) between pre-game ($M = 3.16$) and post-game ($M = 10.85$) levels at home for the major rival. There were no differences for the major rival away or for the moderate rival, although the means for the moderate rival away were almost identical.

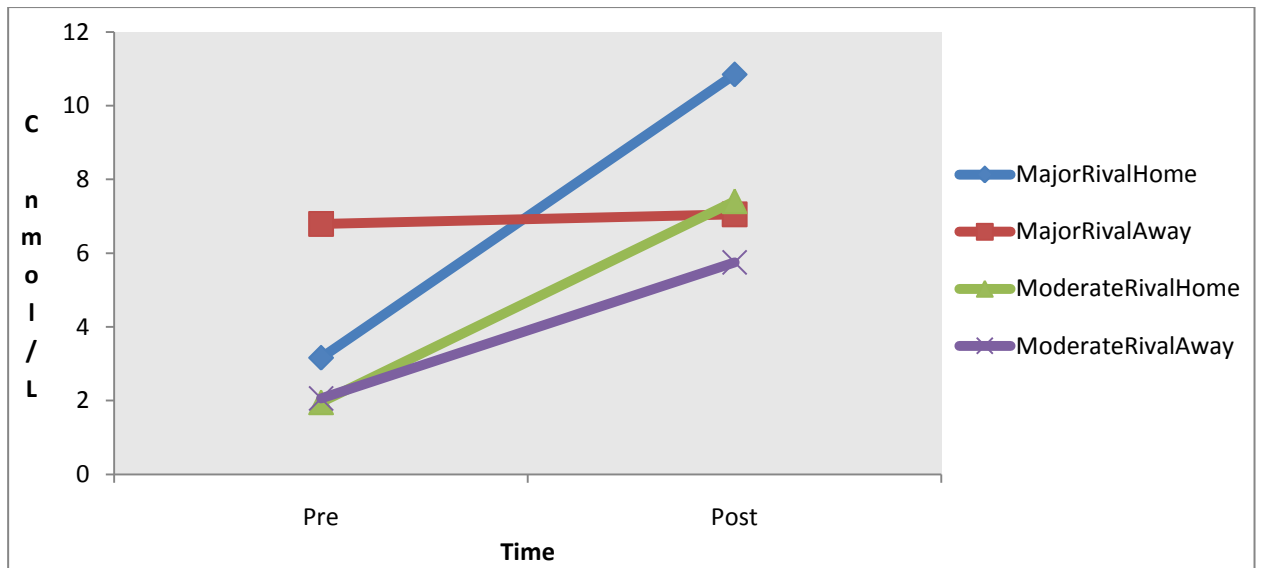


Figure 4.4: Cortisol interaction for rival by venue by time

Table 4.4: Mean (SD) Cortisol Values (rival x venue x time)

N=5	Home Pre (nmol/L)	Home Post (nmol/L)	Away Pre (nmol/L)	Away Post (nmol/L)
Minor Rival	1.96 (1.81)	7.41 (7.38)	2.06 (1.42)	5.75 (5.10)
Major Rival	3.16 (2.31)	10.85 (7.85)	6.79 (5.92)	7.05 (5.10)

4.3.3 Player Ratings

Pre-game anxiety questionnaires were distributed to players approximately one hour prior to game commencement. The pre-game short form anxiety questionnaire (Marteau & Bekker, 1992) was correlated with game hormonal findings using a Pearson's correlation coefficient test. Training anxiety measures could not be included due to incompleteness from players. There were no significant correlations observed between home or away games. Reliability was conducted for the STAI-6 and had an overall Cronbach's α coefficient of .84.

The additional items that were included in the questionnaire were not analysed and this was due to the items being included as preceding buffer items.

4.4 Discussion

The present study had the following objectives; replicate the cortisol findings in the previous chapter with the addition of measuring players pre-game anxiety levels; determine any testosterone differences using a different football team; determine any positional and rivalry differences. It was hypothesised that the target team would produce a variety of game results that could elicit varying hormone responses. The selected team also had a major rival within their league to play against and it was envisaged that this would elicit a strong behavioural-hormone result which could test Wingfield's (1990) challenge hypothesis.

Contrary to the previous chapter, the team studied were on a losing streak and lost every game that was studied (moderate rival: lost home 3-4, lost away 3-1; major rival: lost home 0-1, lost away 3-0). However, the same cortisol result was observed with post-game levels at home significantly higher. Bateup et al. (2002) attributed the rise in female rugby players' cortisol levels during the game to perceived opponent difficulty and whether the team won or lost. The authors additionally stated that the more individuals found an opponent challenging, resulted in a greater cortisol response. The current findings cannot be directly compared to those studies which resulted in a clear winner and loser, research conducted by Elias (1981) found that winners' cortisol levels increased post encounter and Booth et al. (1989) also reported that cortisol was not related to winning and losing. Edwards, Wetzel and Wyner (2006) did note that match competition was associated with increased salivary testosterone and cortisol levels in football in male and female participants. Male data obtained could also not account for a winner or loser effect as only one study was conducted which resulted in a victory. However, the female data obtained revealed an increase in both testosterone and cortisol which were similar in victory and defeat. Hoffman et al. (2002) also reported significantly higher post-game cortisol levels in American football players, although in keeping with the current study they also reported

no differences in testosterone levels. The authors also speculatively inferred that the values obtained could have been a result of chronic fatigue.

As in the previous chapter there were no venue effects for testosterone, and again the findings of Neave and Wolfson (2003) and Carré et al. (2006) could not be replicated. This could be due to the losing streak in the current sample. However, there was an intriguing non-significant trend for positional differences in the data where defensive players (goalkeeper, defender) exhibited higher post-game testosterone levels compared to offensive players (midfielders, forwards) which was irrespective of venue. This is in contrast to the previous chapter where defenders had higher pre-game testosterone levels at home as opposed to away; it is not known of any other study which has found testosterone differences in defenders both post home and post away game. The finding becomes increasingly pertinent as in the current study every game resulted in a defeat. It has been extensively reported that it is winners who exhibit higher post-game testosterone levels (Elias, 1981; Booth et al., 1989; Gonzalez-Bono et al., 1999). In addition, Mazur and Booth (1998) argued that competition which resulted in victory would lead to an increase in testosterone whereas a defeat would lead to a decrease, and in addition losers would display submissive behaviour with a decreased desire to fight. Mehta and Josephs (2006) did report, however that testosterone changes that occurred after a loss predicted future decisions to compete again, and losers who exhibited a rise in testosterone were more likely to compete again than losers who exhibited a decrease in testosterone. The authors further inferred from results that losers who demonstrated increased testosterone levels competed again to try and regain status. Carré, Putnam and McCormick (2009) also documented a relationship between testosterone concentration change and reactive aggression which was particularly pertinent in men who were assigned to a loss condition. The effects of exercise could have also impacted on testosterone findings where it has been reported by Hackney and Dobridge (2003) that short term, maximal and anaerobic exercise (which football can encompass) can result in heightened testosterone levels; however, ninety minutes of sub-maximal moderate intensity exercise has resulted in either decreased concentrations or no change (McMurray & Hackney, 2000).

Cortisol findings also revealed a significant three-way interaction for rivalry with home games eliciting the higher cortisol response, for both the moderate (5.45 nmol/L pre-post cortisol change) and major rival (7.70 nmol/L pre-post cortisol change). Furthermore, the major rival did elicit as expected the highest cortisol response. These values were also higher than the cortisol changes observed away from home for the moderate rival (3.69 nmol/L pre-post change) and the major rival (0.26 nmol/L pre-post change). However, due to the small number of participants which could be included in the analysis ($n=5$) due to missing cases the data obtained is somewhat questionable. Subsequent post hoc tests resulted in a marginal difference observed between pre-game and post-game for the major rival, this may have occurred due to variability in standard deviations or also because some means were nearly identical. It has been widely reported that a relationship exists between the HPG and the HPA axis with both endocrine systems affecting one another. Furthermore, Viau (2002) has stated that the relationship between the HPG and HPA axis is by no means unidirectional (See Chapter 2 for a full explanation). In the present study as already reported, cortisol results were significantly higher post-game which also may have accounted for the non-significant findings that were observed for testosterone. However, mean values obtained suggest that testosterone levels were elevated post-game especially for defenders and overall for the major rival.

Data provided by Salimetrics Europe (2008) suggest that the testosterone normal range for males was 86.17 pg/mL, SD = 23.70. In the present study, looking at the positional differences apart from the defensive players at 105.19 pg/mL, SD = 12.10 post-home game and 104.32 pg/mL, SD = 12.97 post-away game all other values obtained remained below the specified normal range. This may suggest that a negative reciprocal relationship could be occurring with the data; high cortisol levels have been known to suppress testosterone secretion in animals (Sapolsky, 1985). In addition, many researchers have acknowledged that higher cortisol levels can act as a mechanism in potentially reducing cortisol levels in exercise-hypogonadal men (Hackney, 1996). Hackney and Dobridge (2003) have reported that single acute high intensity exercise of around 60% maximum could induce transient increases of cortisol which in turn could produce inhibitory effects on GnRH and LH leading to a reduction

in testosterone. The cortisol values obtained in the current study fall well within the normal values specified for normal adults aged between 21-30 years by IBL International (1.38 -11.60 nmol/L). It should also be noted that the cortisol reactivity in the current study is in line with previous studies that cite a change of 2-7 nmol/l as a response to a stressor (Smyth, Ockenfels, Porter, Kirchbaum, Hellhammer et al., 1998; Wetherell, Crown, Lightman, Miles, Kaye et al., 2006).

The role of cortisol in the present study still remains somewhat ambiguous, results could be partially attributed to the effects of social evaluation. Many researchers have examined cortisol under stressful situations, and one such test which is known to elicit cortisol responses is the Trier Social Stress Test (TSST) developed by Kirschbaum, Pirke and Hellhammer (1993). The test involves public speaking in the form of giving an interview and also a mental arithmetic task such as serial subtractions; in their original research they found that emergent cortisol levels led to between 2-4 nmol/L fold elevations above baseline as a consequence of the TSST. Social support has also been studied with relation to public speaking, and it was reported that males allocated to the partner support condition showed attenuation of cortisol levels in comparison to stranger supported or unsupported men. These results were also different for females, who displayed increased cortisol levels in front of their boyfriends (Kirschbaum, Klauer, Filipp & Hellhammer, 1995).

Attendance figures were documented in the current study, although statistical analyses could not be performed due to the small number of participants who could be included in the analysis. However, attendance figures can still provide useful information, combined home attendance figures were 2117 (moderate rival = 825, major rival= 1,292) and away figures were 1716 (moderate rival = 328, major rival = 1,388). A football stadium that is filled with a vociferous crowd could potentially act as a stressor to the players in the same way that the TSST has been observed to act upon individuals in controlled environments. In contrast, Zajonc (1965) proposed via the Hull-Spence theory that spectators could increase an individual's drive or arousal. Zajonc and Sales (1966) later postulated that spectators facilitated performance of well-learned tasks although they could also impair performance in un-learned tasks. Cottrell,

Rittle and Wack (1967) also studied audience effects and obtained consistent results to Zajonc's proposal. However, the authors noted the study did not explicitly determine whether the presence of others is responsible for audience effects on performance. In addition Cottrell, Wack, Sekerak and Rittle (1968) performed an additional study to determine if the presence of people who were not spectators or co-actors could also elicit this effect on performance. The results showed that the presence of an audience enhanced dominant responses at the expense of subordinates, however the presence of others did not. The authors concluded that they did not support Zajonc's (1965) proposal that the 'mere presence of others' effect was due to innate factors, and instead provided evidence that social facilitation could be due to evaluation apprehension. A vast amount of home advantage literature pertains to crowd effects with authors acknowledging that a home crowd can reinforce good play in home players and have a negative impact on away players (Pollard, 1986). However, Baumeister and Steinhilber (1984) have reported that a supportive audience could be detrimental to a team's performance which could occur as a result from their awareness of being watched. This again could link to the TSST literature but on a much larger scale, and although not directly comparable it could allude to the crowd having possible effects on players' hormone levels.

HPA axis activity is known to display an established circadian rhythm with highest hormone levels evident in the morning within 30 minutes post waking and a steady decrease throughout the day (Hucklebridge, Hussain, Evans & Clow, 2005). Kirschbaum and Hellhammer (1989) have documented that from the hours of between 3-5 pm which was when the current samples were obtained for the major rival, the normal range for cortisol is 4.50, SD = 3.5 nmol/Lcortisol. The authors have also documented that from the hours of between 8-10pm when the current samples were obtained for the moderate rival, the normal range would be around 1.96, SD = 1.7 nmol/L. Therefore, the values obtained in the current study are not indicative of the normal diurnal pattern observed in previous research as there were no statistical differences observed between the two time collections. This factor would have been more problematic and had greater implications if one game had occurred in the morning and one in the afternoon or evening where cortisol values obtained could have been markedly different.

However, this is not considered an issue in the current research as sampling occurred outside the critical stages of the diurnal response. The current cortisol findings could also possibly allude to an exercise effect within the current sample; it is widely known that exercise in general can result in elevated cortisol levels (See Chapter 2 for review). Kanaley, Weltman, Pieper, Weltman and Hartman (2001) have reported that diurnal patterns displayed by hormones could in fact moderate the response of exercise. The authors highlighted that baseline and peak cortisol levels as a response to exercise were significantly higher at 0700 than at 1900 or 2400 hours. In support, Scheen, Buxton, Jison, Van reeth, Leproult et al. (1998) also reported that cortisol levels were higher with exercise in the early morning and were not significantly stimulated by exercise around midnight. Inder and Wittert (2005) have stated the literature surrounding the response of the HPA axis as a result of exercise comprises many conflicting findings; it is dependent on the nature of the stress, the environment and characteristics of the individual, which as a consequence can lead to variability in hormonal data obtained as a result. Kirschbaum and Hellhammer (1989) have reiterated that ideally for hormones which display diurnal variations, samples should be taken between 8-9 am, 11-12 am, 3-4 pm and 8-10 pm. This was not possible during the current study due to the financial implications associated with bioassays and also because of the constraints of working with an elite football team.

In contrast to previous studies such as Filaire et al. (2001) and Edwards, Wetzel and Wyner (2006) who reported relationships between mood measures and hormonal responses, the current anxiety measures did not reveal any relationships with hormonal findings. Neave and Wolfson (2003) also reported difficulty in relating mental states to physiological conditions via coach ratings which could indicate that coaches may not be able to distinguish subtle changes in players mental states. Archer (1991) has also documented that paper and pencil measures have not elicited the proposed relationship with testosterone. The short form six-item STAI was a convenient way to measure players' anxiety levels pre-game, and although relationships could not be sought it did provide a reliable measure of the components. In the current study, the absence of a relationship between the variables could have occurred due to a number of reasons such as players not understanding items, lacking self-insight, dishonesty; inability to distinguish

between fine levels; ceiling effects or simply no actual differences in perceived mood. To fully understand a psychological stress response in football players, Maynard, Hemmings and Warwick-Evans (1995) have stated that somatic intervention strategies could be utilised whereby practitioners could gain insights into player's competitive state anxiety responses using a modified Competitive State Anxiety Inventory 2 (CSAI-2). The authors reported that this could provide a more sensitive measure of state anxiety. In an ideal world this would have been a very useful tool to measure performance; however in the current study time and access issues made this not feasible.

One confounding variable which may have impacted on the present study was that the selected team was on an extended cup run in a national competition around the time that hormonal measures were being collected. This may have inadvertently altered or enhanced hormonal results, although it is impossible to deduce exactly how much this could have affected the players' hormone levels in the current results which all ended in defeats. In contrast to the previous chapter this may also have negatively impacted on the variance of the hormone levels, as defeats have been known to result in suppressed testosterone levels. The increased cortisol levels observed at home could provide further insight in to the concept of momentum and psychological momentum. Furthermore, the cortisol values obtained post game at home in the current study were similar to the preceding study outlined in Chapter 3 even though the teams had contrasting game results (the team in this study were on a losing streak and the team in Chapter 3 were on a winning streak). The implications of these finding suggest that playing at home elicits a stronger cortisol response at home irrespective of game result.

Collecting hormonal data in football players remains extremely problematic. Due to players transferring in and out of the team with no restriction and players becoming injured, statistical values had to be averaged. Speculation can be made with regards to how hormones may contribute to the home advantage which in the current study still occurred with a defeat. However, there are several factors that can elicit hormonal changes, many of which cannot be controlled. Factors such as crowd, individual differences, rival type and game outcome can

make results difficult to interpret, however they are unavoidable variables associated with studying the home advantage.

4.5 Conclusion

The results from the current study indicate a strong cortisol response at a home venue which is in-keeping with the results of the previous chapter. However, as was reported in the previous chapter there were minimal effects regarding testosterone, with only a marginal interaction between playing position and testosterone. It is perceived that the game outcome could be masking the role of testosterone in the home advantage. In the previous chapter the team was on a winning streak and in the current study the team studied was on a losing streak. These rather unique set of results may have had a subsequent impact on the hormones being studied, and the results as a whole may have implications on momentum in the home advantage. More specifically if hormones are potentially affected by momentum including winning and losing streaks.

Whilst both hormones have been implicated in the home advantage the results that have been found so far have potentially masked their exact effects. Thus, further research is needed to ascertain how playing venue can affect these hormones and also explore the marginal finding of perceived rivalry further.

Chapter 5

Turf Wars!

Does Playing Venue Affect Testosterone and Cortisol Responses in Male Academy Players?

“I’ve never wanted to leave. I’m here for the rest of my life, and hopefully after that as well”

Alan Shearer

Chapter 5: Turf Wars! Does Playing Venue Affect Testosterone and Cortisol Responses in Male Academy Football Players?

5.1 Introduction

Several important findings have emerged in relation to the results obtained in Chapter 3 and Chapter 4. The previous two chapters have experimentally established the importance of incorporating hormonal factors within home advantage. There has been an intriguing discovery in relation to post game cortisol surges observed at home in both a team who won every game and a team who lost every game. The results obtained concerning testosterone levels in relationship to venue has not been so straightforward with varying results found pertaining to rivalry and playing positions. The present study will utilise an under-18 Premier League academy football team which will enable a direct comparison to be made to Chapter 3, whilst also assisting the control of confounding variables which were evident in Chapter 4. From utilising an academy team certain confounding variables associated with the home advantage can be eliminated such as a large vociferous crowd, academy teams typically do not play in a stadium which results in a lower crowd. In addition, crowd members who attend academy games are usually comprised of player's friends and family, the club also forbids the crowd to question the referees' decisions, thus reducing referee bias. Due to player ratings failing to unearth any relationships between mood and hormones in the previous chapter; the present study will utilise coach ratings as a measure of player's football performance. It is envisaged that from obtaining player performance levels from the coaches some of the issues regarding honesty, lack of self insight and possible ceiling effects can be eliminated.

It is hypothesised that the findings for cortisol should be in accordance with those found in the previous chapters with a post game rise after home games. Testosterone will again be included as a hormonal measure in the current study. Although, testosterone has not yielded many significant findings thus far, there have been some important findings regarding playing position and previous literature has also found a venue effect for testosterone. The potential

mechanisms discovered so far surrounding hormones and the role they play in the home advantage will aim to be replicated in Chapter 5 to determine whether unified conclusions can be drawn.

The home advantage has been clearly represented as a phenomenon which is known to contribute to the superior performance of teams and individuals alike (see Chapter 2 for review). More recently, Pollard (2008) has reported that despite over 25 years of comprehensive research the exact nature of the home advantage and the factors which operate within it are still not fully understood. The addition of a hormonal explanation has also added to the complexity of the home advantage literature. However, the inclusion of hormones within the home advantage may additionally facilitate in the comprehension of why the phenomenon is prevalent throughout sport. A number of studies have established that the home advantage exists within the sporting domain (Schwartz & Barsky, 1977; Varca, 1980; Courneya & Carron, 1992; Nevill & Holder, 1999; Pollard, 2006). The inclusion of hormonal explanations provides an important addition to the home advantage phenomenon which has been demonstrated by the findings of Neave and Wolfson (2003) and by Carré et al. (2006) who conclusively reported significantly higher testosterone levels prior to home games opposed to away games. Additionally, Carré et al reported a trend in cortisol findings resulting in higher pre-game levels at home. Subsequent experimental studies conducted in this thesis which can be used as a comparison to these two pertinent studies has resulted in mixed conclusions, with Chapter 3 finding only positional differences in relation to testosterone and no venue differences, and Chapter 4 again finding no effects for testosterone.

Cortisol results obtained from Chapters 3 and 4 have unveiled a recurrent theme resulting in higher post-game levels at home irrespective of game result, as one team was on a winning streak and the other team studied on a losing streak. There remains ambiguity over the outcome of a competition and the hormonal response associated with it. For instance, it has been found that cortisol rises in individuals who have experienced a defeat (Bateup et al., 2002) and the same cortisol effect has been found in less experienced athletes (Salvador et al., 1987). In addition, some other studies have reported a lack of hormonal differences as a consequence of

competitive outcome (Gonzalez-Bono et al., 1999; Oliveira, Gouveia & Oliveira, 2009). In Chapter 4 it was postulated that the crowd could have heightened the cortisol response in the players when they played at home. The crowd have been suggested to exert direct influence upon the emotional responses on the players which can occur in a positive, encouraging way or more negatively via pressuring them to play more assertively (Neave & Wolfson, 2004). Moreover, it has been found that the crowd may also not be adverse to experiencing physiological responses, with Maughan and Gleeson (2008) reporting that although no differences in cortisol were found, football fans exhibited elevated heart-rates after their team had scored a goal.

Pollard (2008) has suggested that one problem associated with the inquiry into the home advantage stems from the integration of the factors which are known to impact upon it, namely crowd, travel, referee bias and familiarity. Pollard and Pollard (2005b) have reiterated that if the home advantage is to be fully understood then quantification and isolation of these effects is needed. The current experimental study aims to focus solely on the impact of venue on hormones via eliminating many of the underlying factors which can contribute to it. The effects of a large vociferous crowd can be controlled as academy teams typically only play in front of around 200 people. The effects of travel fatigue can also be partially eliminated as the furthest competitor is approximately a two hour drive away and referee bias can also be eliminated as the spectators who attend are under strict instructions from the football team not to criticise the referee. The variables that may impact on the current hormonal experimental work therefore are psychological factors, tactics, familiarity and territoriality.

It has already been demonstrated in Chapters 3 and 4 that there still remains uncertainty as to the exact mechanisms that can initiate a hormonal response. As a result of combining hormonal factors with the home advantage it can ultimately proceed in unearthing more complex relationships and findings as a consequence. Previous research conducted regarding both areas have resulted in some consensus, whereas others have facilitated further hypotheses and further unanswered questions especially regarding hormonal findings. Subsequent experimental studies in the current thesis have indicated the difficulty in determining a relationship between hormones

and the home advantage, outlining differing effects of testosterone across studies ranging from positional differences to relatively no effects. However, and a more pronounced stable pattern has emerged regarding the cortisol research with significantly higher levels observed post-home game (See Chapters 3 & 4). The influence of hormones cannot be ignored as they could provide essential understanding to players, coaches, fans and psychologists regarding the endocrine responses associated with playing team sport.

5.1.1 Study Rationale

Mixed hormonal results have been obtained so far regarding home and away venues. The findings are complicated by the unanticipated fact that the teams studied either won or lost every game respectively. Thus, a diverse set of game results has not been obtained and full comparisons with previous studies cannot currently be made. The aim of the present study was to investigate possible changes in testosterone and cortisol across venue (independent variable) in a different cohort of male academy football players across three competitive encounters against a major, moderate and minor rival. In keeping with Neave and Wolfson (2003), the hormonal response generated is envisaged to be at its strongest for the major rival where the greatest challenge should emerge. It is also hoped that by including an array of rivals a more representative hormonal pattern will be generated, whilst potentially eliminating winning and losing streaks. More simplistic subjective coach ratings on overall game performance and mental state should provide a general indication of players' performance. This should also add to the limited research findings on relationships between performance measures and hormones which have reported in previous chapters. It is additionally hypothesised that cortisol research will provide a robust replication of findings in Chapters 3 and 4 with an evident post-game rise at home, as well as eliciting a testosterone response in the more challenging games.

5.2 Method

5.2.1 Participants

Twenty male elite academy football players were originally recruited with prior permission from a Premier League Football club. However, due to player injury, not being selected to play and sample contamination this eventually was reduced to 13 players. All players completed an informed consent form at a training session along with a biographical questionnaire relating to age and position played. Mean age of participants was 17.06, SD = .680 years with around 11.07, SD = 2.05 years playing football.

5.2.2 Procedure

The study received ethical approval from the School of Psychology and Sports Sciences Ethics Committee at Northumbria University. Players were asked to produce saliva samples at a training session and one hour before 3 home games and 3 away games and within 30 minutes post game. As in the previous studies, saliva procedures were explained to the players and they were also assigned a participant number. Players were given labelled Salicaps and asked to produce around 5 ml of saliva using a straw before and after training, home and away games. Samples were collected from October to May, with training samples obtained at the beginning of this period. Game samples were collected one hour prior to kick off and within 30 minutes post-game. All games whether they were home or away kicked off between 11.00am and 11.30am. Games were specifically targeted to eradicate any potential diurnal variations in the testing.

5.2.3 Hormone Analysis

The hormonal analysis employed remained consistent with previous studies; therefore please refer to Chapter 3 (p56) for hormonal assaying methodology.

5.2.4 Coach Ratings

It was agreed that the fitness coach who worked on a daily basis with players and attended all training and games would give an overall performance rating and overall mental state rating for each individual player. The ratings were discussed with the fitness coach prior to being issued and were based on a numerical six point Likert scale with adjectives attached: score 1-2 worse than usual; score 3-4 same as usual and score 5-6 better than usual.

5.3 Results

5.3.1 Testosterone

A 3x2 repeated measures ANOVA for testosterone was computed on mean values obtained for venue (training, home, away) by time (pre, post). Results revealed a non-significant trend for venue ($F_{2,24} = 3.17$ $p = .060$) and a main effect (see Figure 5.1) for time ($F_{1,12} = 5.24$, $p = .041$). Post hoc t-tests adjusted using the Bonferonni correction revealed no significant differences for training; however, there was a significant difference ($t = -2.831$, $df = 12$, $p = .015$) between pre-game ($M = 80.47$ pg/mL) and post-game ($M = 116.77$ pg/mL) at home and also a significant difference ($t = -2.935$, $df = 12$, $p = .012$) between pre-game ($M = 60.93$ pg/mL) and post-game ($M = 85.86$ pg/mL) away. There were no interactions. Repeated measure 3x2x2 ANOVAs were also conducted on mean scores obtained for rivalry and playing position; however, there were no significant findings observed.

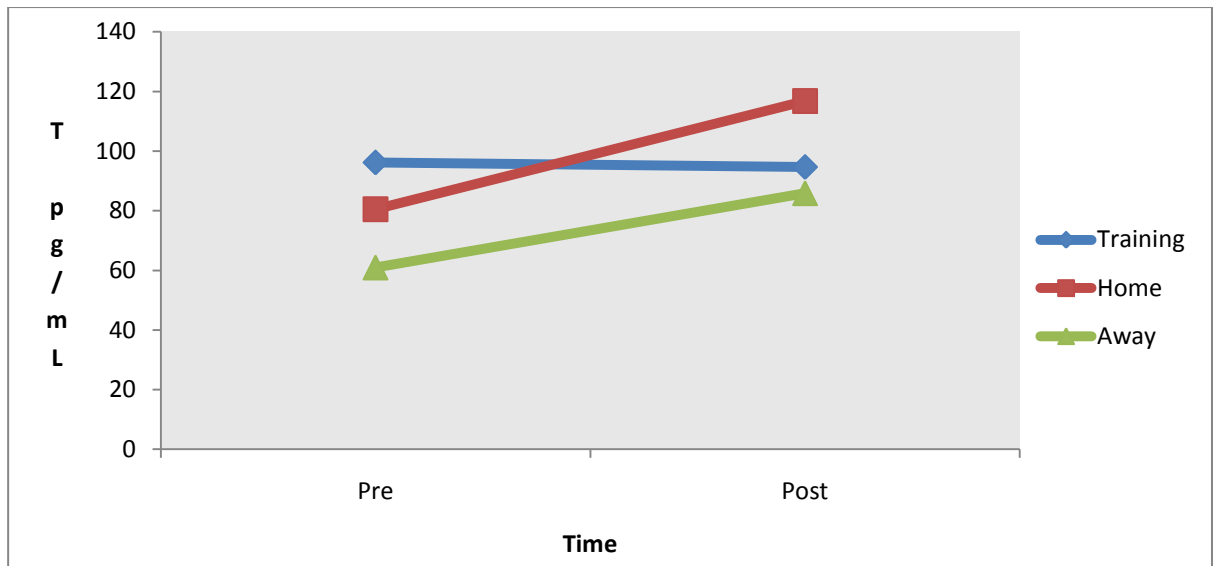


Figure 5.1: Testosterone levels for venue by time

Table 5.1: Mean Values (SD) for Testosterone (venue x time)

Venue	Time	Mean (SD) T pg/mL
Training	pre	96.17 (60.44)
	post	94.65 (44.03)
Home	pre	80.46 (37.28)
	post	116.77 (71.78)
Away	pre	60.93 (33.12)
	post	85.86 (38.47)

5.3.2 Cortisol

A 3x2 repeated measures ANOVA was conducted on mean cortisol levels for venue (training, home, away) by time (pre, post). Participants included in the overall analysis were reduced to twelve because of sample contamination in the home measures for one participant. Analyses revealed no main effect for venue; however, there was a main effect for time ($F_{1, 11} = 44.238$, $p = .000$), with pre-game levels ($M = 6.41$ nmol/L) lower than post-game ($M = 11.38$

nmol/L). Repeated measure 3x2x2 ANOVAs were also conducted on the mean scores obtained for rivalry and playing position; however, there were no significant findings observed.

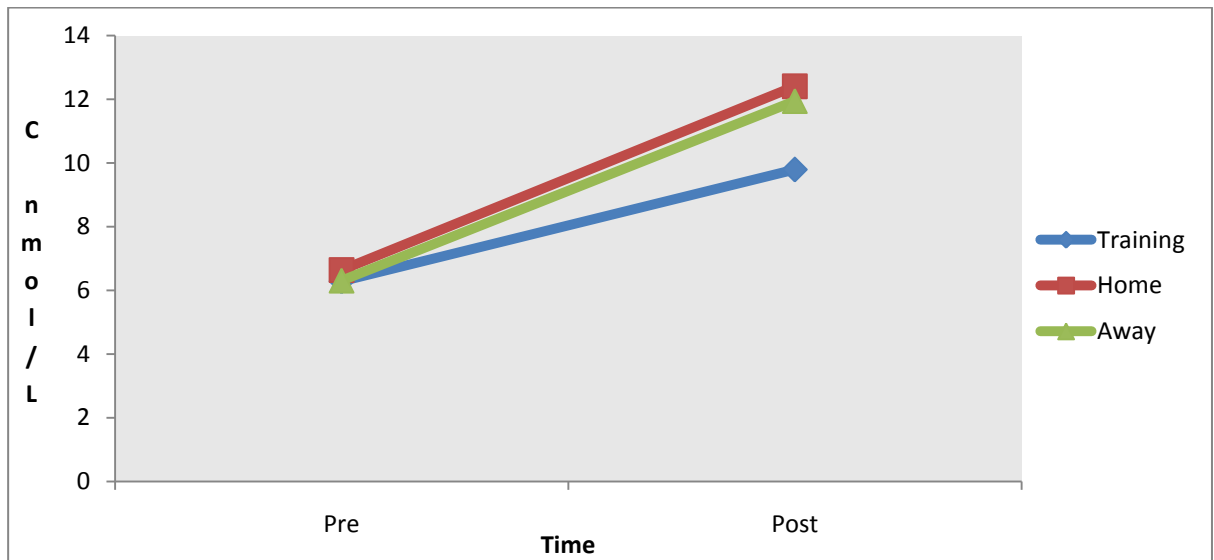


Figure 5.2: Cortisol levels for venue by time repeated measures ANOVA

Table 5.2: Mean Values (SD) for Cortisol (venue x time)

Venue	Time	Mean (SD) nmol/L
Training	pre	6.28 (2.07)
	post	9.79 (3.74)
Home	pre	6.64 (4.09)
	post	12.40 (5.51)
Away	pre	6.30 (.3.23)
	post	11.94 (6.45)

5.3.3 Coach Ratings

The fitness coach provided an overall performance and an overall mental state rating for individual players after each game. These scores were correlated with testosterone and cortisol

levels using a Pearson's correlation. In keeping with previous chapters no significant relationships were found between hormone levels and coach performance ratings.

5.4 Discussion

The present study aimed to replicate previous hormonal findings of a post-game cortisol rise at home with specific regard to the previous academy study. It was also hypothesised that there would be evidence of a testosterone effect in relation to playing position as had been demonstrated in earlier chapters. However, it was envisaged that there would also be a more specific venue effect for testosterone in keeping with the previous research of Neave and Wolfson (2003) and Carre et al. (2006). It was also hypothesised that coach ratings could elicit a potential performance relationship to hormonal findings, even though this had not been found in previous experimental studies. In addition, the academy team selected did not play games in stadiums with a loud vociferous crowd as was demonstrated in Chapter 4. As a result, two of the more prominent factors associated with the home advantage related to stadia and crowd could be partially eliminated, although players' parents and relatives would most likely be in attendance.

In contrast to previous research there was an overall main effect of time for testosterone and a non-significant trend for venue. The main effect for time that was obtained indicated higher post game testosterone levels across both home and away venues, whereas training levels remained stable pre to post. As in one of the previous experimental chapters the team in the present study won all of their home games; however they did lose one match away from home against their major rival. Although, statistical differences were not observed for rival type, this could be attributed to small participant numbers which were included in the statistical analysis due to injury and sample contamination. Previous literature has reported that testosterone levels can display a marked increase as a result of winning a competitive encounter and also a defeat can lead to a decrease in testosterone levels (Booth et al., 1989; Gladue et al., 1989). The apparent post-game surge regarding testosterone could also be linked to the challenge hypothesis, whereby testosterone levels have been shown to rise during an aggressive encounter

in birds (Wingfield et al., 2000). In addition, Oyegbile and Marler (2005) also suggested that a victory can lead to a rise in testosterone with subsequent victories leading to additional testosterone rises although a defeat leads to a drop in testosterone. Thus, in sum testosterone responses which have emerged as a result of a past encounter can be transferred into the next defence encounter.

It should also be noted that an underlying assumption exists in that testosterone appears to have harmful immunosuppressive effects (Folstad & Karter, 1992; Peters, 2000). However, the notion of testosterone having an immunosuppressive effect has been met with some criticism. Braude, Tang-Martinez and Taylor (1999) have suggested that testosterone has a similar effect on the immune system to corticosteroids resulting in immunoredistribution rather than having immunosuppressant effects. Dhabhar (1998) has reported that having an immunosuppressant effect would be harmful and maladaptive, however, redistribution of immune cells would be a valuable adaptive trade off. As a consequence it may be conceivable that testosterone levels are not kept constantly high, but surge in response to a challenge which requires an assertive or aggressive behaviour. In support, Reburn and Wynne-Edwards have reported in birds that when males focus their efforts onto parental rather than reproductive or competitive efforts, then testosterone levels decline accordingly. It is impossible to determine in the present study the duration and exact time point in which testosterone and cortisol levels were elevated. However, it is conceivable that these levels may have risen once the game had commenced and lasted until the game had ended. Ideally, a half time testosterone and cortisol measure should be taken to give an insight as to when hormonal elevations occur. However, this could be problematic and was not possible in the present study due to working with an elite academy team. It is highly likely that coaches would be reluctant to allow access at half time as it is considered as a critical time point.

In contrast to previous experimental findings, cortisol demonstrated a marked increase post-game across all venues, whereas previously this effect had only been found at home. It can be demonstrated that cortisol levels have increased pre-post game irrespective of venue with a similar increase occurring during training. The selection of rivals in the current study was

ascertained from the history of the academy senior football team and also from the results of the previous season. It should be noted that the lack of rivalry effects could be partially explained by some anomalies regarding identification of rival type. For example, the moderate rival could also be considered as a major rival due to the proximity of the two teams, distance to the moderate rival is approximately 37 miles as opposed to 12.4 miles to the major rival. Moreover, it was later indicated by the coach that the minor rival included in the study may not have been a minor rival as the coach reported that the two teams had “history” from previous seasons which was unknown prior to testing. This may potentially explain why there were no significant findings in relation to rival type. Previous research has demonstrated that hormone levels can change in relation to how challenging individuals perceives an opponent. Indeed Bateup et al. (2002) reported that female rugby players who perceived the opponents as more challenging showed a greater rise in cortisol, which further increased after a defeat. In addition, a similar effect has been reported for testosterone in a non-physical competition. Wagner, Flinn and England (2002) reported that male villagers testosterone levels showed no effect of victory or defeat in a friendly game of dominos, but after a competitive game against rival villagers their testosterone levels rose significantly after the domino match.

Determining the exact impact that competition can have on hormones remains problematic in both individual and team sports. Gonzalez-Bono et al. (1999) have highlighted that hormonal research continues to remain difficult. The authors reported no significant differences for testosterone and cortisol in relation to basketball game outcome. The current experimental results support these previous findings, only one defeat was experienced, which subsequently could not give a clear picture of hormonal responses. Some studies have also found an anticipatory rise in cortisol research prior to a football and tennis match (Alix-Sy, Le Scanff & Filaire, 2008; Filaire, Alix, Ferrand & Verger, 2009). However, pre-competition cortisol levels in the current study remained variable and did not exhibit this preparatory rise. Dickerson and Kemeny (2004) reported in their general cortisol research synthesis, despite the ambiguity in research findings, some acute psychological stressors initiate cortisol activation. The authors have further reported that some variability is evident regarding the effects of cortisol

which are subsequently dependent upon stressor characteristics supporting stressor-physiology specificity. In the current experimental research there could be many stressful mechanisms at work, namely: observation from family members and coaches; pressure to maintain place within the team; observed pressure from team mates to succeed; pressure to win and also to maintain league position. These factors could all lead to heightened stress levels which in turn could result in inflated cortisol levels.

As a result of observing individual game cortisol levels it is assumed that there are complex hormonal systems at work which are present within the data set. There seems to be an overarching effect which has eradicated the cortisol findings that were evident in Chapters 3 and 4. One factor which could be providing possible confounds on the current experimental work is the general effects of exercise where it has been widely reported that exercise can effect hormone secretion (see Chapter 2 for review). It is conceivable in the current research that players could have been training or working harder in games which resulted in the winning streak and the accompanying higher cortisol levels. Previous researchers such as Edwards, Wetzel and Wyner (2006) have also alluded to possible physical exercise effects on their hormonal data. Kanaley and Hartman (2002) have also reported that cortisol levels can dramatically increase in response to exercise of sufficient intensity and duration, and it can take a few hours to return to baseline levels. In support, Gawel, Park, Alaghband-Zadeh and Rose (1979) reported a significant rise in cortisol during a period of cycle ergometer exercise which continued into the resting period. Elloumi, Ounis, Tabka, Van Praagh, Michaux et al. (2008) reported in rugby players that training did not affect cortisol levels, but decreased testosterone levels and competition provoked an increase in cortisol whereas testosterone results depended on match stake; psychological measures also inferred that hormone concentrations increased with stress and decreased when psychological conditions remained stable. During high intensity exercise greater cortisol responses have been possibly related to higher ACTH levels with increasing intensity (Kanaley & Hartman, 2002). Inder and Wittert (2005) have concluded that trained and untrained individuals who perform acute high intensity exercise demonstrate a robust increase in ACTH and cortisol. This in turn, is mediated by CRH and AVP via the hypothalamus

and the response can be characterised by the intensity of the exercise. Exercise intensity levels become problematic in the current experimental research due to the physiological requirements of football; it requires both aerobic and anaerobic exercise of intermittent duration. Alix-Sy, Le Scanff and Filaire (2008) have also cited this problem in their research when trying to explain higher cortisol levels prior to a game compared to training. The authors concluded that the physiological demands associated with playing a 90 minute game can elicit greater hormonal responses than in other sports.

One additional factor which has prevented exercise intensity conclusions from being drawn in the current data is that different playing roles for the goalkeeper, defenders, midfielders and forwards result in different exercise patterns, which will undoubtedly result in positional physiological variability within the data. Bangsbo (1994) in his review of soccer physiology reported that on average a top class player covers a distance of approximately 11km during a match. In contrast, goalkeepers are reported to cover a lesser proportion of around 4km per game (Stølen, Chamari, Castanga & Wisløff, 2005). Authors studying individual outfield players performances have reported that midfield players covered a significantly higher total distance than defenders and forwards; first half distances covered were also higher than the second half (Lago-Peñas, Rey, Lago-Ballesteros, Casais & Domínguez, 2009). In the Yo-Yo intermittent recovery test top class players have also been found to perform 28% and 58% more high intensity running and sprinting than players who were categorised as moderate players (Mohr, Krstrup & Bangsbo, 2003). The findings outlined above could have impacted on the results obtained in the present study. However, many of these issues such as the omission of a half time hormonal measure were unavoidable due to the constraints of working with an elite academy team. The issue of positional exercise variability between players could also not be controlled. Moreover, these additional influences may need to be controlled in future studies if it is possible to do so.

It is therefore suggested that future hormone research should encompass some physiological testing alongside the training and competition hormonal measures. Future studies could therefore engage participants in intermittent activity which mirrors a game but in a

controlled laboratory situation; as a result this could provide further insight into the endocrine response to exercise as well as allowing direct comparisons between conditions. However, one potential issue with conducting laboratory based studies is the lack of ecological validity associated with it. Performance measures provided by the coach also remained inconclusive with no evident relationships between hormonal variables and psychological measures. This is in contrast with many studies such as Booth et al. (1989) who found that testosterone correlated with player ratings for mood and the authors reported that mood measures serve as a valuable additional tool. However, there are many studies which also exist where mood measures have not been related to hormonal responses namely Neave and Wolfson (2003) who reported self-ratings related to aggression and dominance obtained from players did not display any relationships. The authors cited difficulty in distinguishing emotion and subtle hormonal changes as possible confounds. In the present work, and in addition to the cited confounds outlined by Neave and Wolfson (2003), lack of relationships between the variables could be possibly explained by the team's largely successful performance, winning five out of six games. This could have resulted in modulated ratings from the coach who could not distinguish variability due to successful performances. However, it should be noted in the current study that the performance measure comprising two items were simplistic and that more accurate and appropriate performance questionnaire should be utilised in future research.

The lack of psychological differences in the current experimental work could require some fine tuning in future research in determining appropriate measures and distribution or training techniques. Indeed, Thomas, Maynard and Hanton (2004) have highlighted the importance of focussing on the intensity, direction and frequency of competitive anxiety during competitive preparation. It could be in the current study coaches may not have been the most appropriate individuals to judge players' mental state and the measure obtained taken did not account for the individual variability in players. Reliance on expert ratings have also been questioned by Maynard and Cotton (1993) who argued that performance measures should be reliable and objective; this could be achieved with the addition of match analysis, thus enhancing the reliability of performance measures. Furthermore, a mental skills package has also been seen

to be of benefit to cricketers, enhancing performance consistency and player performance (Thelwell & Maynard, 2003). This would have been a valuable addition in the current study and would be a worthwhile measure in future studies if the football club sanctioned extra time with the players for its implementation. A greater insight is also needed into the feelings that a player associates with playing venue and how it may impact on their performance. This may assist in explaining the hormonal responses that have been uncovered in the experimental studies so far.

5.5 Conclusion

In summary the present results support the inflated cortisol levels post-game, however in this instance they were not venue specific and emerged at home and away. Unlike the previous chapters there was an evident testosterone effect, with a non-significant trend for venue and main effect of time. As with the previous studies that were undertaken, game results remained consistent with the current team winning every game at home and only losing one game away. This may have impacted on the hormonal responses that were elicited regarding venue. What the research does highlight is the complexity in measuring physiological and behavioural responses to venue in competitive settings.

Despite the lack of variation on game outcomes, the current research does highlight the integral role that hormones play in the home advantage, which need further exploration. The current results also highlight the need to explore hormones simultaneously in order to obtain a clearer picture of their associated effects in the home advantage. Behavioural measures have not elicited any relationships with the physiological measures and this is one area which needs further investigation. One such way to address this would be to explore managers' and players' perceptions of the home advantage in order to determine if they believe there is a physiological explanation of the home advantage. From obtaining perceptions utilising a qualitative approach this would address any issues associated with obtaining quantitative behavioural measures, for example validity, reliability, time and accuracy.

Chapter 6

Strictly Home Advantage!

Football Managers' and Players' Perceptions of Venue in Football:

A Qualitative Approach

“Some people think football is a matter of life and death – but I assure you, it’s much
more serious than that”

Bill Shankley

Chapter 6: Strictly Home Advantage! Football Managers' and Players' Perceptions of Venue in Football: A Qualitative Approach

6.1 Introduction

Having experimentally established in Chapter's 3, 4 and 5 that a hormonal change is evident with regards to playing venue, the need to more fully comprehend these physiological and psychological effects of venue on football players is one that needs to be addressed. Many studies of a quantitative nature already exist and have highlighted factors such as crowd, referee bias, familiarity, travel and rule factors as determinants of why teams perform better at home than they do away (See Courneya & Carron, 1992 for review). It has been previously identified that a trend has emerged regarding the hormone mediated response to playing venue (Carré et al., 2006; Neave & Wolfson, 2003). The quantitative experimental work conducted in Chapters 3, 4 and 5 has also demonstrated these complex hormonal responses. However, player and coach ratings have proved inconclusive in determining mood states and psychological factors that can be associated with these hormonal responses. Thus, a more in-depth approach is required to comprehend the underpinning beliefs surrounding the home advantage and the subsequent effects associated with these factors on players and managers.

This chapter firstly centres upon the rationale of adopting qualitative methods in studying the home advantage before focussing upon qualitative research studies which have been previously conducted in the area of the home advantage. The methodology outlines the study procedures, participants and qualitative data analysis including instrumentation and software. The results are displayed in conjunction with the discussion highlighting emergent themes and their relation to previous research findings.

The primary aim of qualitative research is "to understand and represent the experiences and actions of people as they encounter, engage and live through situations" (Elliott, Fischer & Rennie, 1999 p 216). Patton (2002) has defined qualitative inquiry as "encompassing an active and involved role for the social scientist" (p.53). He has reiterated that qualitative research can

provide an opportunity to achieve an empirical basis in understanding the perceptions of others. Subsequently, Elliott (1995) has reported that qualitative research facilitates the understanding of participants' perspectives, defining the phenomena of experienced meanings and observed variations in order to develop theory from fieldwork. Fossey, Harvey, McDermott and Davidson (2002) have reported that it has become imperative for research to draw upon different perspectives, techniques and methodologies in order to create a depth of knowledge and enhance understanding. Increased popularity in the utilisation of qualitative methodologies has emerged in sport and exercise research (Côté, Salmela, Baria & Russell, 1993).

It has been suggested that researchers in sport psychology should place a greater emphasis on experiential knowledge and the varying idiographic approaches to sports psychology investigation (Côté et al., 1993; Dewar & Horn, 1992; Streat & Roberts, 1992). Previous studies adopting qualitative methodologies have placed emphasis on gaining firsthand perspectives from the athletes and coaches in order to explain predominantly quantitative findings (See Fletcher & Hanton, 2003; Gould, Guinan, Greenleaf, Medbery & Peterson, 1999; Hanton, Fletcher & Coughlan, 2005; Pain & Harwood, 2004). Although, these aforementioned studies have primarily focussed on organisational stress and the performance environment, they have highlighted the importance of qualitative research to the sports psychology practitioner. The research has been particularly pertinent in understanding the social and conceptual factors which can impact on elite sporting performance.

Waters and Lovell (2002) have provided the only qualitative study to date pertaining to the home advantage in football. The authors adopted a triangulated approach combining quantitative and qualitative methods, where a small sample of five players participated in semi-structured interviews and rated psychological factors and mood states. Quantitative data revealed that players perceived the team to be more confident at home. In addition, the qualitative data obtained highlighted the themes of physical and mental preparation, sleep, crowd factors and referee bias as the key factors in which players perceived contributed to the home advantage. The research provided a valuable, yet tentative attempt at gaining insight into the home

advantage using a qualitative methodology. However, more research is required in determining players' beliefs in the factors which comprise the home advantage.

Pollard and Pollard (2005b) have previously created a conceptualisation to represent the factors associated with the home advantage in football (See Figure 6.1) where they have conceptualised research that has been conducted thus far. However, it should be noted the research which underpins this conceptualisation consists primarily of quantitative data. It proposes seven factors, demonstrating that a complex inter-relationship system exists between the factors. However, the authors have stipulated that further research is required to isolate and quantify the effects and the interactions between them.

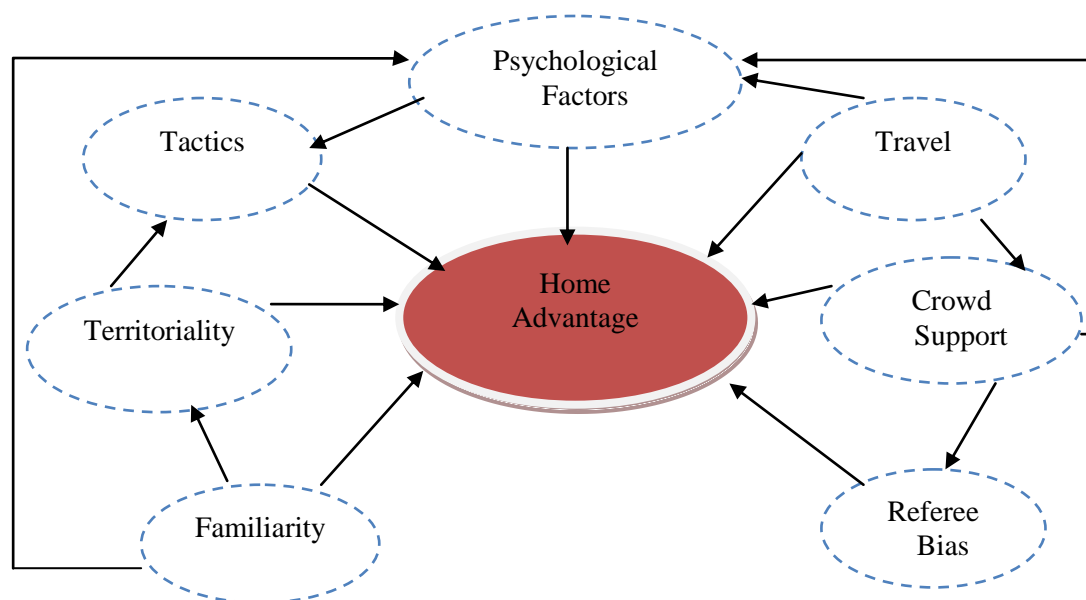


Figure 6.1: Pollard and Pollard's (2005b) Conceptualisation of the inter-relationship of home advantage causes

Although Pollard and Pollard have proposed this initial conceptualisation, research needs to determine the underlying beliefs that underpin the seven identified factors as these have been previously eluded so far. Indeed from further investigation of this model, the factors that are encompassed within it are based largely upon quantitative studies with minimal perceptual grounding. If research into players' and managers' beliefs of the home advantage can be sought

and understood then the above model could be expanded to include more situational, behavioural and psychological factors. Moreover, this could be utilised to enhance team's performance, determine what is required to create a strong home advantage and gain insight into how teams have generated what is colloquially referred to as a 'fortress' when playing at home.

Courneya and Carron (1992) in their early review of the home advantage literature have suggested that a detailed and comprehensive study was needed to address both descriptive and explanatory factors in a single study. The authors concluded that once this had been achieved subsequent studies could be used to adopt an interventional approach. An intervention study could for example, be used to minimise any negative performance aspects and accentuate positive performance. Pollard (2008) has reiterated that researchers exploring the home advantage need to develop a strategy to determine the evident inter-relationships between factors such as familiarity and territoriality in addition to the various psychological factors which can underpin these. He has subsequently recommended that studies need to adopt a multivariate approach or control for confounding variables which are not the main study focus. However, it may be more appropriate to adopt a qualitative approach in order to understand these underpinning beliefs and relationships. Qualitative research could enable an in-depth analysis of the belief systems held by managers and players, thus generating further insight into previously established home advantage factors.

6.1.1 Study Rationale

Using a qualitative approach the present study aims to explore the previously identified factors associated with the home advantage in football. By adopting a qualitative approach, the perceptions of professional players and managers are envisaged to produce an informative firsthand account of the factors which are believed to influence the home advantage. Ultimately, these perceptions could be utilised to assist teams in understanding factors which can impact on a player's performance. Moreover, this information could be used to employ strategies to enhance positive and decrease potential negative factors. In addition to exploring the general

factors associated with the home advantage, one of the main purposes of the study is to explore the possible awareness that players and managers have regarding physiological responses to playing at home. Players and managers will also be asked about their views regarding territoriality and whether they are aware of protecting their home territory. It is envisaged that players and managers could provide a perspective on their feelings before competitive games and possibly identify any awareness of hormonal changes in relation to a competitive encounter. If awareness is identified by the football personnel involved in the study regarding possible physiological and hormonal feelings this may provide support for the hormonal findings obtained in the previous chapters.

6.2 Method

6.2.1 Participants

An opportunity sample was comprised of three male professional football players and six male professional football managers (managers had also previously played football professionally) and ages ranged from 28 years to 60 years (Mean Age= 41.89, SD = 11.00 years). The participants were drawn from the English Premiership, Championship and League 1 in order to provide a balanced representation of the football league and were demographically distributed across the UK.

6.2.2 Procedures

The study was given ethical approval from the Psychology and Sport Sciences Ethics Committee at Northumbria University. Interviews were arranged via email and took place at the player's and manager's football training grounds. In addition, all interviews were conducted in person. At the start of the study interviewees were provided with the project information and asked to sign a consent form indicating that they were willing to take part; approval was also

sought regarding tape recording of the interviews. Interviews were recorded using an Olympus VN-2100PC dictation machine, and a semi-structured approach was adopted, primarily based on previously known factors that influence the home advantage. On average the interviews lasted between 20 and 40 minutes, and participants were allowed to speak freely about their experiences.

6.2.3 Interview Schedule

Before interviews commenced interviewees were provided with an outline of the study and the purpose of the investigation. Questioning commenced with the general statement of *“I’m sure you’re aware that in general teams do better at home than away. What are your personal views on why that’s the case?”*. This opening statement allowed the interviewees to talk about their perceptions without being primed, put the interviewees at ease, and establish a rapport with the interviewer. The interview schedule subsequently followed factors identified by the participants from this opening statement in addition to the seven factors identified in Pollard and Pollard’s (2005) home advantage model. Participants generally identified the more pronounced home advantage factors initially such as crowd, familiarity and travel related issues. The additional explanations that had not already been mentioned were also added, such as role of the referee, tactics, experiences of away venue and feelings prior to playing (for full interview schedule see Appendix C). Due to the order in which factors were raised by interviewees the initial interview schedule was not robustly followed as the interviewer allowed the participants to identify the themes themselves firstly, and also allowed them to expand on their beliefs. The interviewer also asked for clarification on unclear points and probed for more in-depth responses to determine the interviewees’ perceptions and feelings about venue, whether it be home or away. At the end of the interview the interviewer thanked the managers and players for their participation.

6.2.4 Data Analysis

The interviews were transcribed word for word; they were listened to and read through several times in order to familiarise with the data and identify emergent themes. A sentence by sentence analysis was employed and the computer software programme QSR NVivo (version 8) was utilised in the categorisation of themes and also for data storage. The data were coded using thematic analysis, a qualitative method frequently employed to identify, analyse and report patterns within a data set (Braun & Clarke, 2006). It has also been reported by Boyatzis (1998) that thematic analysis can also assist in the interpretation of the data set. The main focus of data analysis in the present study was to verify the existing seven factors and also to determine the underlying sub-themes which impact on the home advantage. It was envisaged that these underlying factors were the underpinning beliefs held by managers and players that would give greater insight into the previously established factors of the home advantage.

A top-down or deductive approach to thematic generation was initially employed, as Pollard and Pollard (2005b) have previously conceptualised the most pertinent higher-order factors in their review of football and the home advantage. The authors generated these higher-order factors from reviewing literature pertaining to the home advantage. Braun and Clarke (2006) have stated that from using theoretical thematic analysis it allows the research to be driven by the researcher's theoretical and analytical interest in the data set. The authors also state that from adopting this approach it tends to provide a less rich description of the overall data, although it does provide a more detailed analysis of aspects of the data. Hyde (2000) has reported that from introducing a deductive approach to analysis it can highlight an important step in assuring research conviction in qualitative findings. Subsequent coding was influenced by these previously established findings although did not remain exclusive to them. Themes which did not lend themselves to these seven factors in the current study were categorised as miscellaneous and were analysed separately in order to establish any additional higher-order or sub-themes. Inductive content analysis was performed on this data in order to determine themes which had not already been highlighted by previous research whereby the analysis was guided

using the procedures outlined by Patton (1990). Patton identified that raw verbal data should be organised into interpretable and meaningful themes, with categories which have emerged from participant quotations. Coding and theme generation was discussed with other qualitative researchers within the School of Psychology and Sport Sciences at Northumbria University. However, it should be noted that because coding was centred primarily on individual interpretation it was not necessary to conduct inter-rater reliability. Previous research has determined that inter-rater reliability calculations would only be appropriate if the codes were to be used for quantitative analysis or when coding needs to be replicated by a second coder (Yardley, 2008). In addition, the author has stated that this type of analysis in qualitative data is unusual and requires a sample size which is large enough in order to meet the requirements to perform statistical analysis on it.

6.3 Results and Discussion

Initially, Pollard and Pollard (2005b) identified seven factors in their home advantage conceptualisation which consisted of familiarity, travel, crowd support, referee bias, territoriality, tactics and psychological factors. These factors comprised the majority of higher order factors in the current study. In addition to the emergent higher order themes, several sub-themes underpinning these higher-order themes were also identified, examples include; crowd assisting performance, supporter type, referee bias towards team, players and crowd, solutions to assist referees, home routine, away standards and physiological responses. From the collation of themes an elaborated conceptualisation was constructed (See Figure 6.2) from Pollard and Pollard's (2005b) home advantage conceptualisation. The proposed extended conceptualisation encompasses the belief systems which underpin the seven pre-determined higher order themes. Interestingly, the analysis also unearthed two additional higher-order themes which were continuously cited by interviewees. These higher-order themes of experience and control were identified by the majority of interviewees as having an impact or an effect upon the original higher order themes. Each higher-order theme and the accompanying sub-themes which are

encompassed within them will be discussed in turn below. The source of quotation pertaining to managers is represented using '*M*' and the source of quotation pertaining to the players is identified using a '*P*'. The letters are then followed by the relevant associated participant numbers.

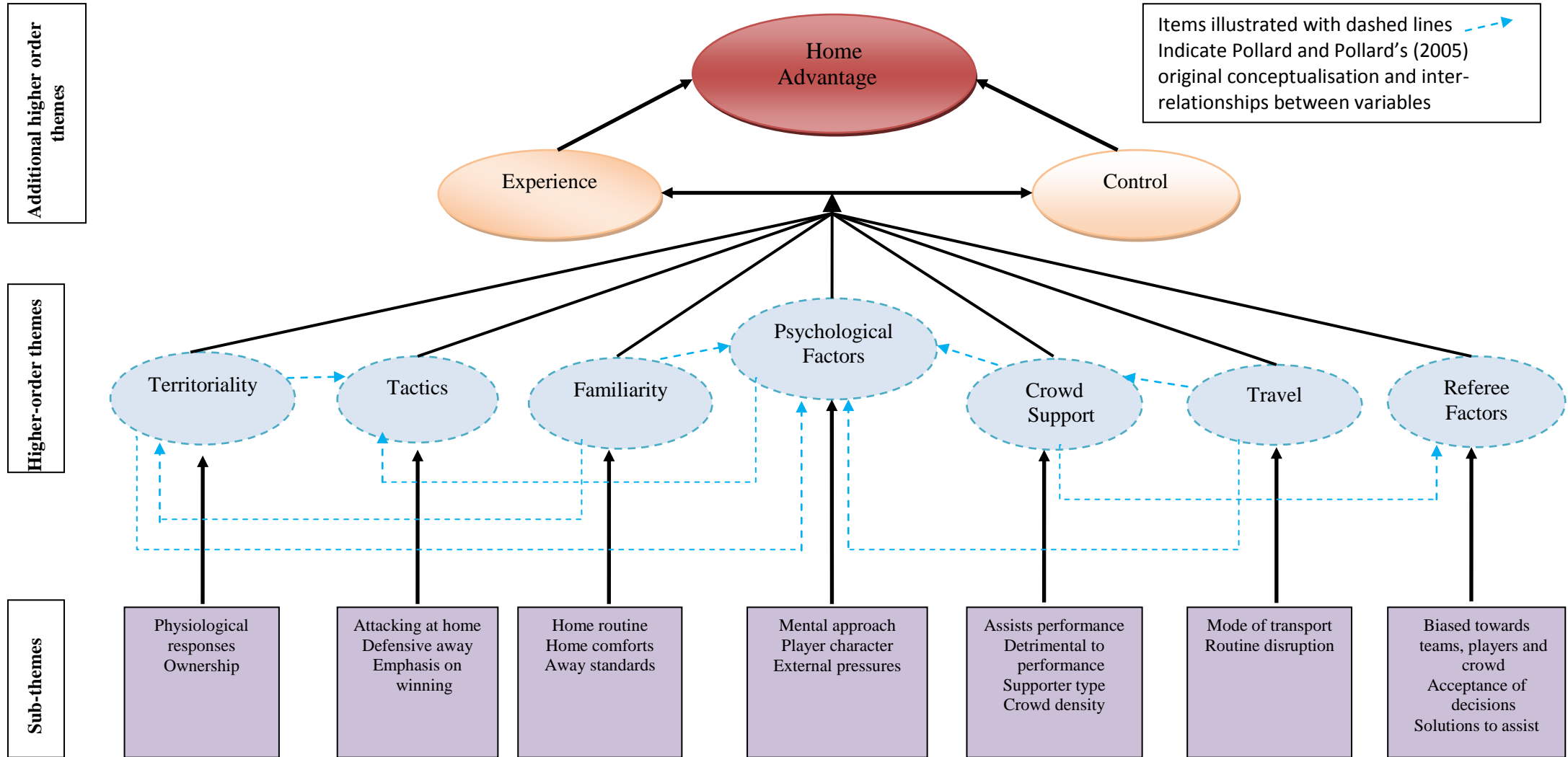


Figure 6.2: Extension of the conceptualisation of the inter-relationship of home advantage causes

6.3.1 Additional Higher-Order Factors

6.3.2 Experience

Interviewees consistently alluded to their experience in managing the individual components encompassed within the home advantage. Players and managers reiterated that they were not affected by such factors because of experience they had gained with age. They also suggested that the home advantage factors would have impacted on them more when they were younger and that they had witnessed these effects on the younger players in their team. The following quote encapsulates this:

“When I was younger yes...I think when I was younger maybe the crowd.... or to play in front of 50,000 fans would put pressure on me but now I’m 31 I’ve got experience and everything..now it’s more easy for me to play every game you know, I don’t have the pressure to play now...when I was younger a little bit now it’s more usual for me to play in front of 50,000, even if I play away” (P1)

Pain and Harwood (2007) have also identified experience as a factor which could influence tournament performance in football and players frequently cited that they knew what to expect and could cope better as a result. These findings are strongly supported in the current study although in a more generalised context of experience in playing at different venues more so than with experience of international tournaments.

6.3.3 Control

The issue of control consistently emerged across the higher order factors with interviewees acknowledging that they felt in control at home but less so away. They also reported a lack of control over external factors such as the referees and crowd but simply had to accept it. Indicative examples of the control higher-order factor included:

“The whole atmosphere and the buzz is certainly different because this is our stadium, this is our ground and we’re in control, we want to be in control” (M1)

“it’s got more to do with not being able to control... as a player you are in control, I was in control of preparation, how I played, how I reacted and the effort that I put into it..I think as a manager as soon as they cross the white line you relinquish control” (M4)

The identified factor pertaining to control can be highlighted and explained through locus of control (LOC) and illusory control. Biddle (1999) has described LOC of reinforcement as the extent to which an individual perceives that reinforcements are within their own control, controlled by other people or occur by chance. Individuals who have an internal LOC believe that their own behaviour influences an outcome and individuals who exhibit an external LOC attribute outcomes to external factors such as chance, luck and fate (Cox, 1998). Paulhus, Molin and Schuchts (1979) studied football players’ perceptions of control and utilised the Spheres of Control Model, which is a multidimensional model of LOC encompassing items pertaining to personal control, interpersonal control, and socio-political control. The authors reported that football players displayed the highest interpersonal control scores within the Spheres of Control Model, which the authors believed to be indicative of predicted orientation towards team coordination and cooperative relationships.

Illusory control refers to the inflation of success expectation above an objective probability, and an overlap between skill and luck is evident. Furthermore, skill situations display a causal link between behaviour and outcome and success is controllable whereas luck is uncontrollable (Langer, 1975). Studies have shown that individuals can overly inflate the amount of control they have over a given scenario for instance Wolfson and Briggs (2002) studied the national lottery and reported that 92% of people preferred to choose their own numbers with 23% of those believing they had a greater chance of winning. In addition Hoorens and Harris (1998) have highlighted that individuals report a higher frequency of healthy behaviours and a lower frequency of unhealthy behaviour when comparing themselves to others. In the sporting domain Laurendeau (2006) has reported that skydivers overestimate the amount of control they exert over their sport which leads to increased risk taking and defensiveness over hazardous conditions.

6.4 Higher Order Themes and Sub-themes

6.4.1 Crowd Support

Pollard and Pollard (2005b) in their review suggested that the exploration of crowd factors and their influence was difficult to isolate and quantify and posed a number of questions which still remain to be answered. These questions focussed on crowd density and intensity; effects on home and away team and effects on the referee. Through the utilisation of a qualitative methodology many of the unanswered questions surrounding the home advantage could be addressed. Several emergent sub-themes emerged when interviewees were asked about the effects of the crowd and consisted of assists performance, supporter type, crowd density and detrimental to performance. The results and explanations will be summarised individually:

6.4.1.1 Assists Performance

This theme pertained to the home crowd and emerged as a pertinent factor. It has been previously suggested in the home advantage literature, and the interviewees endorsed the impact that the crowd had on their performance. This can be characterised by the following quote:

“I do yeah I think the crowds were fantastic really, and I think even when the players probably weren’t er...at their best I think the crowd lifted them to you know give that little bit more which I think all the good crowds do” (M6)

These findings are in accord with Wolfson, Wakelin and Lewis (2005) who reported that football fans rated themselves as having the greatest overall contribution to the home advantage. In addition, fans also reported that they took credit for inspiring their team to victory, distracting opponents and influencing the referee. Crowd support has been previously identified by athletes and coaches in an Olympic setting, and teams that either met or

exceeded expectations consistently indicated crowd factors as a positive performance influence when compared to teams which met or failed to meet expectations (Gould, Guinan, Greenleaf, Medbery & Peterson, 1999). In a further study, U.S Olympic coaches also reported that they felt their athletes performed better in Olympic competition with loud enthusiastic crowd support (Gould, Guinan, Greenleaf & Chung, 2002).

6.4.1.2 Supporter Type

The players and managers both alluded to differences between their team's supporters notably between those supporters who only watch the team at home and those who watch both home and away games. The players and managers suggested that the supporters who travel to their away games are more highly identified. Interviewees also suggested that there were differences between home and away supporter characteristics such as temperament and mentality. This can be highlighted with the following quotes:

"I think our fans still expect us to win on the road now but they still go with a different...I still think there is a slightly different mentality that they have" (M2)

"travelling fans that go to away games are always probably the die hards the ones that....support the club through thick and thin so they're always probably the most supportive whether you are playing well, good or indifferent they're the ones that really get behind the team"(M4)

It has been widely postulated that differences in home and away fans exist, however, there remains a dearth of literature surrounding supporter type and the differences in attitude and tolerance between the home fans and the subsequent travelling fans. Fan literature has tended to focus upon team identification and how strongly fans associated themselves with their target team and the psychological factors that can affect them (See Wann, Melnick, Russell & Pease, 2001 for review). Interviewees also spoke freely about the opposition's fans and their experiences of interacting with them; they

reported that receiving abuse was inevitable but that some team's supporters were worse than others:

“you get some teams that are more abusive, get more behind their team it sort of depends if you play at Milwall if you come on as a sub and warm up on the side you just get loads of abuse you do have places that are more like that” (P3)

6.4.1.3 Crowd Density

Past research has focussed upon crowd density and the impact that a large vociferous crowd can have on team performance with varying conclusions drawn. Schwartz and Barsky (1977) showed that crowd size increased the effects of the home advantage in baseball with the percentage of home games won rising from 48% at 20% capacity to 55% at 40% capacity. However, this crowd density effect has not been found in ice hockey (Agnew & Carron, 1994). Pollard (1986) examined crowd size effects in football and concluded from a review of four divisions in England that little evidence existed for the effects of crowd size on the home advantage. Neave and Wolfson (2004) also supported these findings, with their analysis of the 2002-2003 English Premiership revealing no relationships between crowd size or density and the home advantage. Indeed, the team that had the lowest crowd density actually had the best relative home record. Although the evidence for the effects of crowd size and density remains unclear, the majority of interviewees in the current research stated crowd size was important. Managers and players frequently cited the size of the crowd and how important it was to have a big following behind them. This can be encapsulated from the following quotes:

“I think from joining a club like (X) it was..to actually walk out to an empty stadium then a full stadium and realise then actually this is a big big club, you felt proud, you felt more important..it gave you a bit of a buzz, give you a bit of a lift as a player” (M3)

“I think when you have the fans behind you erm...like 50,000 fans, big atmosphere. I think it helps the players give their best” (P1)

Although statistical evidence may be inconclusive about the effects of crowd size and

density, interviewees did report that a large home crowd was beneficial to their playing performance. One interviewee suggested that one of the reasons that he chose to sign for his current team was because of their large vociferous crowd and admitted that this was a major factor which persuaded him to join. This seems to suggest that the size of the crowd has a psychological impact on players and they can use this to enhance their performance, it also suggests that crowd size can have an impact on whether a player will sign for a particular team or not. Research has also centred on the type of stadium that games are played in, with Zeller and Jurkovic (1989) reporting that players who perform in domed stadia show a greater home advantage. The findings could be potentially due to noise reverberation or perceptions of nearness to the crowd. However, interviewees in the current study did not allude to any differences in stadium design.

6.4.1.4 Home Disadvantage

Interestingly, all of the interviewees also commented on the detrimental effects their crowd can have on a player's performance and how this can be used against them by the opposing side. They have also stated that many managers can use this as part of their team talk when playing against opposition with a vociferous crowd. Crowd effects according to one manager are normally predetermined by the football club's scouts, and it is they who provide this information. This is one factor that has also received a lot of attention, with Baumeister and Steinhilber (1984) reporting in baseball that a home crowd could increase players' self consciousness resulting in an overall distraction. This perspective has been criticised by Schlenker et al. (1995b) who reported in baseball that World Series games which rested on the final game were all won by the home side. The current research seems to support the findings of Baumeister and Steinhilber's (1984) study with the majority of interviewees reporting that they did find that the home crowd could be detrimental to their performance and could actually help the opposing side:

“I can imagine a lot of teams that come to our place this year will say if we keep the home crowd quiet for the first 20 minutes then...etc., cos we’ve all been there and we’ve all done that ourselves when play away at a big club” (M2)

“If we went to Cardiff away and their fans if we get on top of them, Swansea away as well their fans, we can hear them and as an away side that gives you, you think that they’re under pressure now, and they start trying to do things out of their norm to try and get better but that’s when they make mistakes. Sometimes that’s part of your team talk” (P2)

From a performance perspective this may be very detrimental to the home side and could provide support for the decline in the home advantage, a factor which has been previously noted by Pollard and Pollard (2005b). Currently, football clubs are employing schemes to encourage fans to attend games. This increase in fans will subsequently lead to increased revenue for the club which is essential in the current economic climate. Football fans now pay hundreds of pounds for a season ticket or between £20 to £50 per individual ticket; these prices may impact on how they view their team. For instance, if they are not satisfied that they are getting value for money or that their team is not performing to their expectations, then they may take action. This has occurred on numerous occasions throughout the football league with fans chanting, wielding banners and booing their own team. This in turn, has been reiterated by the interviewees as having negative impact upon the players and their performance, as well as facilitating increased motivation in the opposing players.

6.4.2 Referee Factors

Recently, referees have become increasingly under the media spotlight with criticisms emerging from football managers and players about fitness, decision-making and bias towards certain players and teams. Interviewees were asked their views on referees with regards to their overall views and whether they could be influenced by aspects of the game. Pollard and Pollard (2005b) in their original research proposed that this factor should be termed referee bias. The current study has unearthed many additional factors that encapsulate

factors pertaining to the referee and hence the more generalised higher order theme title. Three sub-factors emerged from the interviews consisting of bias towards teams, players and crowd, acceptance and acknowledgement; and lastly solutions to assist.

6.4.2.1 Bias Towards Teams, Players and Crowd

It has been widely acknowledged that referees can be influenced by the crowd in competitive games, with Nevill, Newell and Gale (1996) reporting that more red cards and penalties were given against the away team when compared against the home team. Sutter and Kocher (2004) also found that referees were more likely to award legitimate penalties to the home team as opposed to the away team. Nevill, Balmer and Williams (2002) reported that referee decision making was significantly altered in referees who heard a crowd noise condition as opposed to a no noise condition, indicating crowd effects on the decisions. Interviewees in the present study also believed that referees could be influenced by the crowd, certain teams and players:

“Sometimes, I think...and now the referees are in awe of some of the stars, some of the so-called big players, I think some referees can be in awe of them” (M3)

“it’s always irritated me I was a defender myself of course and it always irritated me that forwards could get away with types of tackles that a defender would get red carded for” (M2)

In addition, many of the interviewees also suggested that referees should be asked whether they felt influenced by these factors and what their perceived role was in the home advantage. This provides one future avenue for research. Wolfson and Neave (2007) have reported that referees admit to making mistakes and perceive this as an opportunity for reflection and improvement.

6.4.2.2 Acceptance and Acknowledgement

Interviewees were very critical of the referee in indicating that they could show bias towards players and teams; however, they were also aware that referees are under intense pressures. Interviewees also acknowledged the difficulties a referee faces within the game, and both players and managers commented that referees were “only human” and mistakes were inevitable:

“in the heat of the moment you can become frustrated with some of the decisions that are made but the cold light of day you understand that everyone makes mistakes and they try to do the best they can” (M5)

“the referee he is like in the middle.. you know the atmosphere can er..sometimes they are under pressure as well you know, they are under pressure, can you imagine...the referee and it is the final of the World Cup, I think he is under pressure like a player” (P1)

The excerpts suggest that the interviewees are very aware of the pressures that referees are faced with and demonstrate an element of sympathy towards them in their responses. However, many of the interviewees had previously made disparaging remarks about referees being biased and affected by external factors. The interviewees also demonstrated a certain understanding and appreciation as to why mistakes can be made by referees.

6.4.2.3 Solutions to Assist Referees

Many of the interviewees felt strongly about two factors: the use of video technology to assist a fourth official who in turn could assist the match referee and also ex-players fast tracked as referees as they had more knowledge of the game.

“they should use the 4th official, like when I was at (X) we had monitors in the dug outs, one was live time, one with a 10 second delay so that we could see exactly if a decision was right or wrong and the premier league banned that at the start of last season because they thought it was an unfair advantage but my take on that is why don't the 4th officials have that, because they can help the referee out” (M2)

“I would personally like to see ex-players be given an opportunity to be fast tracked to become referees because they do and can see certain scenarios that maybe referees don’t understand so I would be in favour of ex-players becoming referees” (M5)

Interviewees also suggested that frustrations with referees are intensified when the referee is unwilling to admit to a mistake or talk about their decisions. Referees themselves have identified the crowd, managers and players as providing the major sources of aggression to them (Folkesson et al., 2002). Wolfson and Neave (2007) also report that referees are subjected to unrestrained negative feedback. The current findings could suggest that if referees were open to some form of dialogue and admitted some responsibility over key incidents where they have made a mistake, aggression and criticism toward them might become less intense. This can be demonstrated with the following excerpt:

“so you if you improve communications between everybody, it’s difficult because the referees have been ostracised, well not ostracised. They’ve had to close ranks which you can understand but if it’s going to get better then we’re going to have to open up lines of communication but they’ll only open up lines of communication with people that they can trust so they’re not getting slagged off” (M4)

6.4.3 Familiarity

Familiarity is one of the most frequently cited reasons for the home advantage across previous literature. A study conducted by Bray, Culos, Gyurcsik, Widmeyer and Brawley (1998) stated that 64% of individuals indicated they performed better at a home venue, with 31.8% endorsing venue familiarity as the main contributor. This has also been mirrored in coaches who have endorsed venue familiarity as the major home advantage contributor (Gayton, Brioda & Elgee, 2001). Many of the familiarity studies conducted to date have tended to centre on the pitch, the use of artificial turf and how this enhances the home advantage (Barnett & Hilditch, 1993; Clarke & Norman, 1995). Interestingly, pitch type and dimensions were not mentioned by interviewees, this could be partially due to the absence of artificial turf in the leagues from which interviewees were recruited. Interviewees in the

current study were more forthcoming with regards to their surroundings which were broken down into three sub-themes: home comforts, home routine and away standards.

6.4.3.1 Home Comforts

This item pertained to the luxuries that were associated with playing at a home venue and consisted of having external factors that made the interviewees' playing experience easier. Examples reported by interviewees included having their own car parking places and a designated space in the changing room. However, for many interviewees it was also about seeing familiar faces within their club and being able to rely upon them if needed; these factors can be encapsulated with the following quote:

“it's a more familiar feeling, the people when you get there the parking in your own parking place all the way through to like I say familiarity of seeing people you're comfortable with, and the fact that if you need anything there's a 99.9% chance you get it”(M1)

Although a lack of research exists to support this, it has been referred to as a factor by Neave and Wolfson (2007) who have stated repeated exposure to a stadium could possibly make the home team feel more confident, comfortable and assertive. Supporting research also exists in the social psychology domain in relation to the exposure phenomenon, where the mere exposure to others can produce feelings of attraction. Moreland and Zajonc (1982) conducted experiments to explore the possible relationships between familiarity, similarity and attraction. Participants viewed photographs of faces, where results revealed that familiar faces were viewed as more likeable and similar to themselves. The authors further reported that the effects of familiarity on perceived similarity were mediated by changes in attraction. Pollard and Pollard (2005b) have reported that general benefits in player's preparation could also be attributed to preparing for a game in a familiar and friendly environment; this is one issue which requires further examination. Additionally, future research could focus upon the different leagues and conditions which players operate in relation to playing facilities, in

particular which surroundings makes a player feel comfortable. This could provide one explanation as to why a reduced home advantage is evident when a team moves to a new stadium. Pollard (2002) analysed 37 teams that moved to a new stadium and found that home advantage was significantly reduced during the first season post-stadium move. The information provided by the interviewees could be used as a warning to clubs who are considering moving to a new stadium and stadium design, as using this information could help counteract the reduced home advantage when a team moves to a new stadium.

6.4.3.2 Home Routine

This sub-theme closely relates to the home comforts theme which is outlined above although it focuses more on having a set pre-match home routine rather than the effects of the surroundings on players. The majority of the interviewees reported they had the same routine at home which included: waking up at certain hour; having breakfast at a certain hour; then making their way to the ground. The following quote illustrates one interviewee's routine:

"Yeah I think you know, you sat in the same place in the dressing room you had... the same pre-match routine usually on the same piece of grass....you always warmed up, you know you'd walk out and always go to your left" (M4)

It has been widely acknowledged throughout the sporting world that many sports performers have a routine before they play or compete, however there is a distinct lack of literature to support this. Most research has tended to focus upon superstitions, rituals and pre-performance routines before skill execution such as taking a penalty kick. Cohn (1990) has stated that pre-performance routines involve a combination of intricate cognitive strategies and behavioural responses; cognitive strategies can include self-talk, visualisation and relaxation whereas behavioural aspects include physically practicing a movement. Although, these factors have been considered as essential for performance the current findings seem to suggest many individuals adopt a pre-performance routine related more to

their basic functioning, such as having established places where these routines could occur. Superstition can also partially relate to the factors identified by the interviewees. Superstition has been identified by Womack (1992) as an action which is repetitive, formal, follows a sequence and remains distinct from any technical aspect of performance. Buhrmann, Brown and Zaugg (1982) reported basketball players identified superstitious behaviours relating to clothing, pre-competition and post-competition ritual, food and activities during competition. In addition, the authors stated from having these routines it can lower pre-competitive anxieties. It is unknown in the current study as to whether this could be substantiated but it does provide a future avenue for research.

6.4.3.3 Away Standards

Interviewees made comments on the playing facilities of other teams where they had played previously. The negative aspects were constantly accentuated and many of the interviewees reported their own facilities were largely far superior to some of the teams that they visited:

“The first time when you turn up at...maybe Grimsby and you go into their changing room it borders on ridiculous, it's no bigger than a box bedroom for 20-odd people to get changed, hold a team talk, do your stretches, I mean you go in the bathroom and it's dilapidated! I'm in the bath trying to do my stretches whilst the lads have a pee!!” (M1)

The interviewees did, however state that as stadiums have been upgraded changing facilities have improved and have become less daunting and odious to visit. This could also provide one explanation as to why the home advantage has been in decline across the football leagues, in that technological advances have made the facilities less harrowing resulting in a more comfortable environment for teams to visit. If facilities are similar or more tolerable then it could potentially have a lessened psychological effect:

“When you play in some old stadium like Fulham or Portsmouth you know it's not very niceyou have to play at home and away.” (P1)

6.4.4 Travel

Travel is a factor which has led to conflicting views in the research, and the majority of research has not reached a conclusion as to the extent of travel disruption on performance. Courneya and Carron (1991) reported little or no effects of travel on performance which has also been supported in a football study conducted by Pollard (1986). Neave and Wolfson (2004) have reported that away games ultimately lead to early morning departure times, boring coach journeys and could lead to disruption in mental preparation and circadian rhythm. The majority of this has been reiterated by interviewee's and two sub themes emerged, mode of transport and routine disruption.

6.4.4.1 Mode of Transport

The majority of travel related studies have focussed on flying across time zones and the effects of performance and again provided inconclusive results with travel accounting for 1.4% of the variance in the win/loss outcome (Pace & Carron, 1992). Interviewees frequently reported that they preferred to travel by plane, stay over before a game and that travelling by coach was boring. Moreover, this theme has been previously found by Waters and Lovell (2002) who reported that players preferred to stay over before a game to be given time to adjust and settle down into their routine.

"I don't really like travelling on the day of games and we have done that a couple of times if it's only an hour, hour and a half but I prefer to be at home, or travel overnight, I'm not a fan of travelling on the day." (P3)

Qualitative research conducted by Fletcher and Hanton (2003) and a further study by Hanton, Fletcher and Coughlan (2005) have reported travel factors formed part of elite sports performers organisational stress and although considered detrimental this was not an inevitable detriment to performance. Although research has found travel disruption to have a

minimal effect on game results and performance, it could provide a psychological issue for players. Many interviewees admitted that they had been lucky to have the luxury of flying to games and being able to stay over in nice hotels before they played:

“I was quite lucky that the clubs that I played for were quite erm...we travelled really well, we flew to most games the day before and we’d always stayed in top hotels, prepare for the game in the right way so that was a plus point” (M5)

6.4.4.2 Routine Disruption

Familiarity in terms of routine has received very little attention; the closest study was conducted by Kauss (1980) who explored the concept of unfamiliarity and the disadvantage to the visiting team. Three sources of disadvantage were identified: physical characteristics of the stadium, distractions in the game and pre-match routine disruption. Waters and Lovell (2002) also reported that players expressed concerns about their sleep, bad food and how this could subsequently alter their pre-match preparation. The following quotes demonstrate this, as well as the impact of staying in a hotel:

“I think the difference is you are in somebody else’s hands in respect of they’re preparing your dinner, you might end up in a bed that you don’t particularly like, the room might be hot there are such a lot of unaccountable variables that can come into play” (M1)

6.4.5 Psychological Factors

Pollard (2008) has reiterated that due to players’ and coaches’ awareness surrounding the existence of a home advantage that mental attitude before and during a game will be affected. Interviewees were not directly asked about the psychological nature of the game, although they frequently mentioned it as a variable when accounting for their experiences. Three sub themes arose with regards to psychological factors these were: mental approach before a game, player character and external pressures.

6.4.5.1 Mental Approach

This sub-theme pertained to how the interviewees mentally prepared before a home or away game and how they felt before playing. This item also revealed psychological mechanisms that could be drawn on to give an individual or team confidence. This can be perfectly highlighted using the following quote:

“I used to hate playing at (X) as an away player but again when I played for them I knew how much players hated going there, and we always used to say when Friday afternoon comes along and that wind machine gets going it was horrific, a horrible place to play if you are an away side but it gives you that home advantage in the sense that you knew people didn’t like going there” (M2)

Pollard and Pollard (2005b) stated if players believed in the existence of the home advantage then increased confidence could occur as a result, thus facilitating its continued existence. The above football manager quote demonstrates how prior expectations can result in a psychological advantage which can be gained over opponents when an external factor is clearly expected. This factor clearly relates to the higher-order theme of familiarity with the playing venue but from a psychological perspective. Many of the interviewees stipulated that if they were mentally prepared in what to expect from the game then their performance could be sustained.

6.4.5.2 Player Character

Interviewees also stated there were some players who could play well at home but away from home their performance suffered. However, in all cases interviewees never identified themselves as being this type of player, many would admit they did not like playing at an away venue but never that their performance suffered as a consequence of this dislike:

“some of the players... they’re scared to play away or they don’t enjoy playing away” (P1)

This type of player was often colloquially referred to as a ‘homer’ by the interviewees. This is also a term that has been frequented in the media where some well known professional players have often refused to play away from home. It is interesting to note that none of the respondents indicated that their own performance was sub-standard away from home and this strongly relates to the notion of an illusory superiority. This indicates individuals can adopt a more positive view of themselves compared to others (Alicke, 1985) and individuals have also been found to make more flattering judgements about themselves than others have made of them (Lewinsohn, Mischel, Chaplin & Barton, 1980). Wolfson and Neave (2007) also found this to be apparent in football referees who believed their own skills were far superior to their fellow referees. Using a strategy such as illusory superiority or self-aggrandizement can serve as a buffer to remove aspects of self blame and can help provide a rationale for a bad performance.

6.4.5.3 External Pressures

External pressures were directly linked to the media and how media sources can exert pressures on players, managers and referees. One interviewee also remarked on how the media has changed traditional kick off times due to televised rights. The example below indicated the extent to which the media can impact upon the game, and the interviewee has stated the media can affect how the game is viewed:

“the media plays a huge part in how people perceive the game and how they....how the crowd can possibly then behave. It’s interesting when you go to some foreign countries there’s none of this nonsense at half time talking about what’s happened you just see the game...the commentary is very basic and often people have to make their own minds up whereas, here to a large extent the public are told what to think” (M2)

Boyle and Haynes (2004) reported a vast amount of coverage is dedicated to football in the media and this has been enhanced by the media providing a large funding source to the game. However, in the present study interviewees have indicated that this media presence

can provide an additional source of stress from which players, managers and referees have to operate. The example also indicated cultural differences associated with football which emphasised a heightened intensity in the UK. Research to date has focussed more on the economic impact that the media has on football and sports in general, rather than the psychological impact it may have on the football agencies that comprise the game. Emphasis has been placed on the relationships between sport, media and identity formation and the cultural, economic and political issues which impact upon them (Boyle & Haynes, 1996). Gould et al. (1999) also identified media as a theme in their interviews with athletes and coaches and reported increased media exposure was identified as both positive in that a team gained good exposure and negative with athletes becoming the centre of attention. The current findings suggest a deeper insight could be sought into the relationship between the media type whether it be television or media based and how it impacts on players, managers and referees. Cultural differences in media coverage could also be explored.

6.4.6 Tactics

Previous research has centred on the tactics employed by teams and how they differ between venues. Pollard and Pollard (2005b) inferred that defensive away tactics could have accounted for differences between the knock out stages of the European Cup and the domestic league. Some interviewees also believed tactics differed between home and away, although many stated the main emphasis for every game was inevitably winning irrespective of whether it had been entertaining and enjoyable to watch. Three sub-themes emerged regarding tactics and encompassed, defensive away, attacking at home and emphasis on winning.

6.4.6.1 Attacking at Home and Defensive Away

The first two of these sub-themes can be demonstrated by one interviewee's perspective who identified that tactical differences existed between venues and also between team quality; a discussion of these factors will take place in the general tactics discussion below.

"I think sometimes you can see some big differences when the team plays at home to away...like I think you attack more when you play at home and defend more when you play away. When you play Manchester at home you expect to come forward more than when you play at Manchester because we played Manchester and we defended like...around 85 minutes in the game" (P1)

6.4.6.2 Emphasis on Winning

Some interviewees also felt their main tactical concern centred on winning the game rather than settling for a draw or containing teams. Football especially in the current financial climate has become a results driven business, managers and players are under intense pressures to get a result. This applies more to the managers of the team as ultimately if their team does not win they will inevitably lose their job and source of income. Interviewee's stressed the importance of winning and stated tactics could be modified, ultimately so points would not be relinquished.

"I've tried to treat the games almost the same in terms of going out to win, never send out my team to just try and get a draw, you always try and get a win then you take a draw if it's not possible to get the win....but you know you might change your tactics in terms of the way the opposition are set up but the overall principles of what you're trying to do will always stay the same in your philosophy and your beliefs" (M5)

Due to the closeness of the sub-themes that encompass tactics an overall discussion of the themes will be subsequently employed. Pollard (2008) has reported no firm evidence exists to link tactics to the home advantage. The sub-themes in the present study clearly show that interviewee's acknowledge the differences in tactics at home and away venues. Many

have also highlighted that attacking football can be achieved more comfortably at home and defensive tactics are employed at away venues due to pressures. Pressures can include lack of pitch familiarity, tactics employed by opposing managers and a potentially vociferous opposing crowd. In addition, Pain and Harwood (2007) identified from their interviews with players, managers and sports scientists that the main tactical focus centred upon tactical development which included watching videos and awareness of the opposition. The themes generated in the current study suggest team quality could also impact on game tactics, and one of the interviewee's uses Manchester United as an example of how this can be illustrated. The interviewee indicated that when a team plays opposition like Manchester United that tactics become more defensive and are devised to contain the opposition. Furthermore, offensive moves are limited to counterattacks. Madrigal and Jeffrey (1999) reported from their study that all teams held a prominent home advantage however, teams categorised as strong won 70% of games compared to 64% in moderate and 60% of teams categorised as weak. The relationship between tactics and team quality is also an aspect that requires future research from both a qualitative and quantitative research perspective.

6.4.7 Territoriality

This concept has provided the newest addition to the growing literature base surrounding the home advantage and has stemmed from studies such as Neave and Wolfson (2003) in football players and Carré et al. (2006) in ice hockey players who documented a hormonal response in relation to playing venue (See Chapter 2 for review). Although this response has been documented experimentally, studies have yet to determine the beliefs held by sports personnel as to their views on why this might occur. Indeed, many of the interviewees did not directly state that they felt territorial but did use language and verbatim to describe feelings that could be attributed to territoriality. Two sub-themes emerged from the interviews and are categorised as ownership and physiological response.

6.4.7.1 Ownership

Ownership pertains to interviewees feeling a strong sense of possession over the team or a feeling that something might be taken from them, in the present case points. The interviewees acknowledged that their home stadium acts as a second home. This is highlighted with the following quotes:

“you don’t want to be beat, you want to sort of the proverbial let’s not get beat in our own back yard. This is home territory we don’t like people coming here and taking things off us” (M1)

“This year I have been injured at the start of the season but you know for me it is a second home” (P1)

“it was more like home because I spent most of my time there...you know you’re there on a daily basis it becomes...you know the fixtures and fittings becomes second nature.. the changing rooms, the corridors, the going out on to the pitch, the pitch itself it becomes part of what you’re about”(M5)

Altman (1975) has previously identified three territories consisting of: primary territory or a person’s home which evokes a strong protective response; secondary territory such as school or a workplace which evokes a moderate protective response and lastly, public territory such as a shopping centre which evokes a minimal protective response. The theme of ownership in the present research suggests a home venue can act as a second territory for the players which subsequently elicit strong feelings of ownership and initiate a protective response. The quotes from the interviewees suggest that they do actively defend their territory and feel a sense of ownership over parts of the stadium such as the changing rooms and pitch. These findings provide perceptual support to the previous study of Neave and Wolfson (2003) and also provide support for the previous studies in this thesis.

6.4.7.2 Physiological Response

It has been well documented that hormonal changes can occur in relation to the

physiological and psychological aspects of sports competition (See Chapter 2 for review). However, it is possible that many sports performers are not aware of this and some of the interviewees repeatedly alluded to feelings prior to a game that a hormonal or physiological response could be occurring. Interviewees in the current study tended to refer to this response as ‘adrenalin surge’ or ‘adrenalin rush’ and they indicated that this was still apparent as a manager as well as a player:

“yeah I think you’re aware of it when things go well because I think you...you know get that adrenalin surge because you are doing well and the crowd respond” (M4)

“the following pre-season I went back on my own and I was just walking in the stadium for some reason I had to go down there for something and I walked down the tunnel and the hairs stood up on the back of my neck” (M1)

“I think it’s the adrenalin that’s going, worried about your performance or now worried about the team’s performance” (M6)

“I was only ever out the game for 3 months when I left X erm but I missed that adrenalin.... cos you can’t, you can’t take a drug or anything like that to give you that adrenalin rush that is there when you win a game or when you score a goal it’s amazing” (M6)

It is evident from the quotes that interviewees were aware of a physiological response to playing although they are maybe unaware to the exact hormonal changes that can occur as a result. Interviewees phrased these hormonal changes as adrenalin ‘surge’ or ‘rush’ terminology which is typically used within the sporting domain. One interviewee even alluded to a physiological factor when he had visited the stadium in a non-competitive situation during pre-season. This provides support for the physiological responses associated with playing venue and territoriality. It also highlights the strong protective response that a player can exhibit about a territory even when not playing a competitive game.

In order to fully understand the precise mechanisms regarding physiological responses further education may be required regarding hormonal changes and the psychological effects that can accompany these changes, so that managers and players can

gain an informed understanding. This provides some underlying belief support for the previous experimental chapters relating to the hormonal changes that can occur with playing. However, interviewees did not specify differences between venues, which an important factor that also requires further exploration.

6.5 Conclusion

The present study aimed to uncover the underlying beliefs that underpin the popular explanations for the home advantage in football and why teams or individuals are known to perform better at home than they do away. Secondly, the interviews were also conducted with the aim to provide an explanation for the experimental research conducted in Chapters 3, 4, and 5 regarding the apparent differences in cortisol and testosterone in relation to venue. Pollard and Pollard's (2005b) original conceptualisation revealed seven themes pertaining to the home advantage. These seven themes were reinforced by the interviewees although two additional themes emerged and were conceptualised as experience and control. These two factors were suggested by the interviewees as impacting upon many of these predetermined themes. As a result these were categorised as major order themes which impacted upon the seven higher order themes. Many underpinning beliefs were also elicited and provided the underlying factors which were encompassed within the seven higher order themes.

The results have revealed that the nature of the home advantage is not simplistic and supports previous suppositions of a multifaceted phenomenon, comprising a number of inter-relationships between variables. The current findings support the statement of Pollard and Pollard (2005b) who have also outlined the complexity of the factors which comprise the home advantage. The current study has provided a valuable insight into the core beliefs held by managers and players, which is one area that Pollard (2008) identified for investigation. Only one study thus far has utilised qualitative methods to explore the home advantage, this study was conducted by Waters and Lovell (2002). The authors found five factors from combining qualitative and quantitative methods: physical and mental preparation, sleep,

crowd factors and referee bias. The current study provides a solid platform for future research and has uncovered many of the prominent beliefs held about the home advantage. It is believed that the current study builds upon and extends previous research findings substantially via a greater in-depth assessment of these beliefs.

Pain and Harwood (2004) have previously stated that a range of barriers exist which have hindered psychologists working within football more specifically professional football. These barriers have included finance, negative connotations and misconceptions. However, the strong emphasis placed upon psychology in the home advantage by both players and managers suggest that psychology is becoming more commonplace within the professional game. From managers and players in the present study acknowledging the importance of sports psychology in gaining a competitive edge, it could lead to increased implementation of psychological support throughout the game.

The present study has also identified a number of avenues for future research including: distinguishing levels of fans and supporter type, the psychological effects of venues including routine disruption and the role and perceptions of the referee in the home advantage. Further triangulated research could be utilised to explore these factors further encompassing focus group and questionnaire based methodologies. A focus group could elicit stronger associations and differences whereby individuals could discuss personal experiences together which may result in a more in-depth account of these additional factors and beliefs. The beliefs generated in the current study could also be utilised in the composition of a quantitative questionnaire to focus on individual groups or individual home advantage factors. The current findings could be drawn upon to design future studies of an interventional nature which Courneya and Carron (1992) identified as an issue to be addressed in order to maximise sports performance under these conditions. The findings also have implications for football personnel especially owners and managers of teams who could draw upon these additional factors to inform their players, game strategies and the impact of travel before competitive games.

Chapter 7

Blowing the Whistle: County and Elite Football Referees' Perceptions of their Role in the Home Advantage

“The referee was amusing. Here they either shoot you down with a machine gun or
don't blow their whistle at all”

Gianluca Vialli

Chapter 7: Blowing the Whistle: County and Elite Football Referees' Perceptions of their Role in the Home Advantage

7.1 Introduction

The previous qualitative study presented in Chapter 6 highlighted football players' and managers' perceptions of how football referees can play an instrumental role in the home advantage. The present chapter aims to investigate county and elite level football referees' perceptions of their role in the home advantage in relation to themselves but also to draw comparisons with their fellow referees. The current chapter will briefly review the pertinent literature regarding the home advantage and how referees, or officials as they can also be referred, have been known to contribute to it. In addition, concepts such as illusory superiority and optimistic bias will be reviewed as these psychological factors have also been utilised in research pertaining to referees. The current study will adopt a quantitative approach via online questionnaire data collection in determining county football referees' perceptions of the home advantage. Finally, the study will be discussed in relation to previously identified literature, and strengths and limitations will be identified.

Football referees have a clearly defined role within the competitive game, which includes jurisdiction to enforce the laws of the game, control of the match with cooperation from the assistant referees, time keeping and ensuring safety of players to name but a few (<http://www.refworld.com>). Helsen and Bultynck (2004) reported an average age of 40.2 years, SD 2.8 years for football referees and their assistants in the Euro 2000 Championships. When this is compared to players' ages the difference is more pronounced as the average playing age in the top European leagues is approximately 26.1 years (The Professional Football Players Observatory, 2009). Referees are known to cover around 10,000 metres per game whilst their assistants cover approximately 7500 metres (Reilly & Gregson, 2006), thus indicating that referees and their assistants have to be physiologically prepared for their role within the game. It has also been found that English Premier League referees' physical match

performance closely relates to that of the players; referees' high-intensity running distance has been correlated with players' high-intensity running (Weston, Castanga, Impellizzeri, Rampinini & Abt, 2007). Differences have also been found with regards to refereeing levels and as referees progress into elite level referees their training becomes more specific, more intense and comprises of different types (McMahon, Helsen, Starkes & Weston, 2007).

Football referees are under intense pressure and criticism from external agencies, and they experience immediate, un-restrained negative feedback (Wolfson & Neave, 2007). Indeed, elite level referees, possibly more so than those officiating at other levels, are known to face the most intense pressures. Examples of abuse from the crowd, managers and the players themselves have been demonstrated by Folkesson et al. (2002) in their sample of football referees. Referees from other sports such as volleyball and football have identified that making an incorrect decision comprises their biggest source of stress (Balmer et al., 2007; Kaissidis & Anshel, 1993; Stewart & Ellery, 1998). However, there still remains some ambiguity over this issue; Goldsmith and Williams (1992) reported that volleyball and football referees did not believe that verbal abuse, time constraints and physical harm contributed to their stress levels. In their comprehensive study Wolfson and Neave (2004) suggested that when a football referee is faced with around 60,000 fans shouting penalty, it becomes increasingly difficult for a referee to decipher whether or not a penalty had occurred; certain information processing may become compromised where unconscious decision making can occur as a result. The authors also reported that the pressures which stem from a large vociferous crowd could encourage or act as a threat to the referee via a 'motivational' social pressure effect such as crowd pleasing or displeasing.

More recently referees have been subjected to increasing criticisms stemming from football managers and the media. In 2009, Sir Alex Ferguson, in disregard of the prominently launched FA Respect Campaign, criticised match referee Alan Wiley as not fit enough to referee the game stating "The pace of the game demanded a referee who was fit. He was not fit" (<http://news.bbc.co.uk>, 2009). In addition, Stoke City chairman Peter Coates (2009) asked his current manager Tony Pulis not to criticise a referee's performance, additionally

stating that big clubs and their managers bully referees whilst smaller clubs play fairly (<http://www.thisisstaffordshire.co.uk/sport>, 2009). There are many factors which are known to contribute to the difficulty in refereeing a game; it has been widely reported that referees can succumb to the effects of a partisan crowd leading to decisions being made in favour of a home team. Downward and Jones (2007) studied the FA Cup referees between 1996-2002 and reported that a greater number of yellow cards were shown to the away teams, whilst a non-linear relationship was also observed between crowd size and yellow cards. However, one study conducted by Scoppa (2008) has reported that within the Italian Serie A football league, referee bias becomes significantly reduced when there is a running track situated around the football pitch. The author attributes this bias reduction to the crowd being further away from the referee when he or she makes a decision, and thus has less of an impact.

Many studies have concentrated on the role and negative aspects of referees such as bias and poor decision making. The presence or absence of crowd noise has been known to significantly affect the decision making of referees where those hearing the audience awarded fewer fouls against the home team (Nevill, Balmer & Williams, 2002). The authors also noted that these referees gave similar decisions to the actual match referee. In contrast, those referees who were allocated to a no crowd noise condition were more certain with their decisions, awarded a greater number of fouls against the home players and chose more no foul options. A study conducted by Sutter and Kocher (2004) found that home bias existed in the German Bundesliga and noted that football referees were more likely to award more legitimate penalties to the home team as opposed to the away team. The authors further stated that in the 2000/2001 league that home teams were awarded 55 penalties; however, visiting teams were awarded only 21. A statistical based study has also revealed that home team bias is a very plausible factor when considering disciplinary sanctions (Dawson, Dobson, Goddard, & Wilson, 2007). This research could also imply that visiting teams are more reckless away from home and take more risks which lead to greater infringements. Jones, Paul and Erskine (2002) have suggested that prior knowledge of a team's aggressive reputation influenced the decisions of a referee. Boyko, Boyko and Boyko (2007) examined

5244 English Premier League matches between 2002-2006 seasons and reported home bias differed between the 50 referees that were involved, with the more experienced referees giving a lesser home advantage. The authors also reported a higher baseline home advantage in most referees with only a few referees showing a lower home advantage; it was subsequently concluded that referees could control the amount of home bias that they show. However, Johnston (2008) has reported that caution must be applied to these previous findings as during a re-analysis of the 2006-2007 English Premier League data some of Boyko et al's (2007) original assumptions could not be replicated to sustain their claims, with no significant variations found between referees and the home team advantage.

In order to cope with such high pressure situations there has been a strong emphasis placed on the need for referees to receive psychological support. Sports governing bodies have become aware that referees need psychological support to provide coping strategies to deal with stress and sources of threat (Mahoney, 2003). As a consequence, it has become essential to understand the various cognitive processes, such as coping styles, employed by referees. Anshel and Weinberg (1999) examined American and Australian basketball referees' coping styles which were categorised as approach and avoidance styles. The authors also highlighted demographical differences between referees; American referees tended to use an avoidance coping style (stayed calm, ignored the coach), whereas their Australian counterparts employed the approach coping style (answered politely, had discussions with the coach). This strategy has also been applied with rugby union referees who have studied training tapes on tackling under the guidance of an expert; providing a correct interpretation of the result has been found to significantly improve referee's decision making accuracy in a game (Mascarenhas, Collins, Mortimer & Morris, 2005). However, the researchers have also acknowledged that when individuals become constrained by time pressures, they could become more susceptible to concentrating on the more salient cues to which they are subjected. Wallsten and Barton (1982) have stated that information processing occurs in two stages resulting in either a tentative binary decision or a degree of confidence in their choice. In support, significant relationships have been found in football referees, notably between

referee decision bias and increased cognitive anxiety and mental effort; this has been attributed to referees attempting to cope with the psychological demands caused by crowd noise via giving more popular decisions in favour of the home team (Balmer et al., 2007). The most comprehensive study to date which has focussed on the cognitive demands placed on referees was conducted by Wolfson and Neave (2007) who examined referees' views on coping methods and reasons for continuing as referees. Results indicated that over 16 hours per week was spent on refereeing, with 71% of referees feeling physically drained after a match. However, 100% of respondents said that the time and energy spent refereeing was worthwhile. Referees externalised the reasoning behind dissent and attributed this to others' lack of knowledge and bias; they also admitted to making errors and turned this into a situation for reflection. In addition, referees rated themselves as better than their fellow referees, which has been termed as illusory superiority.

It has been extensively reported throughout psychological research that individuals can adopt many cognitive strategies which can assist them in dealing with adverse situations (Taylor & Brown, 1988; Wolfson & Neave, 2007). Individuals misrepresenting reality by holding positive illusions can be adaptive for their mental health and wellbeing, especially where these illusions can take a positive form in maintaining both cognitive and social functions; some examples of this include positive self-evaluations, perceptions of control and unrealistic optimism (Taylor & Brown, 1988). Moreover, individuals can differ substantially in how they view themselves, with some having highly inflated positive views but others can hold more realistic views (Robins & Beer, 2001). To assess this difference in self-enhancement bias the authors devised two studies, one testing performance in a group interaction task and the other illusory beliefs about academic performance. Results showed that self-enhancement bias was related to narcissism, ego-involvement, positive affect and self-serving attributions. The second study revealed that self-enhancement bias correlated with self-serving attributions which were generally associated with higher self-esteem, while self-enhancement was negatively associated with self-esteem change.

Self-serving attribution has been applied in the study of academic achievement and sports competition. Lau and Russell (1980) conducted a review of newspaper articles and reported that players and coaches attributed success to internal factors such as skill opposed to external factors such as bad weather which were associated with losing. McFarland and Ross (1982) conducted experimental research to assess the impact of outcome (success vs. failure) and attribution (internal vs. external) in an achievement setting. It has been previously shown that attributions of success which relate to the self can be associated with positive affect and attribution of failure to self is associated with negative affect. The authors found that participants in the success condition thought they had performed better than those in the failure condition, and vice versa. Moreover, participants in the task-attribution condition stated that the ease or difficulty of the task contributed to success or failure more than those in the ability condition. Success produced a greater positive affect, lesser negative affects and greater self-esteem.

In keeping with task success and failure Crary (1966) has reported that task failure can lead to incongruence for an individual and he has defined these incongruent experiences as “those which are not consistent with an individual’s ideas about himself” (p246). Furthermore, these incongruent experiences have been described as potentially threatening to the individual. In order to substantiate this, Crary conducted a false feedback study which looked at high and low self-esteem males, half of whom succeeded in a task and half failed. The author reported that incongruity led to defensive behaviours via distortion and denial and also led to a decline in problem-solving performance. McAuley and Duncan (1989) also manipulated future expectations in their study to examine the effects of unexpected outcomes on causal attributions and affective consequences. The authors utilised a cycle ergometer competitive task, and participants were randomly allocated to high or low expectancy groups, with a three win or three loss strategy. Furthermore, they found that winners had significantly higher positive affect than losers.

Causal attributions have also been examined in individuals with mental health issues, with varying outcomes. Kuiper (1978) examined depression and causal attributions in

success and failure; the research highlighted that non-depressives made internal attributions for a successful outcome and external attributions for unsuccessful outcomes which is consistent with self-serving bias. However, for those individuals with depression their failure was internalised, and contrary to the authors expectations, depressed individuals also internalised successful outcomes. It should be noted that these findings are inconsistent with explanatory style research where it has mainly been found that individuals with depression or mental illness tend to deny their own role in success (Peterson & Seligman, 1984).

One other mechanism that individuals can utilise to maintain their psychological wellbeing is illusory superiority, which occurs when individuals view themselves as having more positive qualities than others (Alicke, 1985). Alicke proposed that accurate self-evaluation can accrue desirable consequences and foster an individual's need to enhance or protect their self-esteem. To test this notion he asked college students to rate themselves and others on a variety of traits; it was found that participants perceived themselves to be characterised by more desirable traits than the average college student. Buunk and van der Eijnden (1997) also found that individuals tended to have higher regard for themselves than for others; the authors examined the relationships of Dutch adults and found that they perceived their relationships as much better than others. The notion of illusory superiority is not without criticism; Colvin and Block (1994), for example, have stated that the assumptions made by Taylor and Brown (1988) are open to dispute as they are based on a weak empirical foundation lacking a conceptual structure. However, Colvin and Block do acknowledge that positive illusions exist and can regulate mood.

The explanations that have been provided by various authors outlining illusory superiority, self-serving bias, attribution and global self-evaluation could assist in understanding the perceptual mechanisms of referees, which have been experimentally shown by Wolfson and Neave (2007). In line with previous studies it is likely, therefore, that referees will view themselves as more superior than other referees and also externalise factors in order to preserve their self-esteem. Referees are continually working in an environment where they are subjected to a vast amount of criticism. As a consequence referees may place

higher importance on external factors as contributors of the home advantage in order to maintain their positive global self-evaluation. These external factors are likely to include absolution of blame and influence, accompanied with inflated positive views of themselves in order to maintain their psychological wellbeing. In the context of the home advantage these factors are considered as pertinent and provide an important research area to pursue.

7.1.1 Study Rationale

There is a paucity of research regarding referees' perceptions of the home advantage particularly regarding the role of the referee within it. The present study aims to explore potential differences in perceptions of home advantage across two groups of referees, elite and county. Further factors of referee level and years of experience will also be considered. It is hypothesised that county and elite referees will view themselves as more superior than their fellow referees which is in-keeping with previous research in the area pertaining to illusory superiority. It is also envisaged that neither county nor elite referees will opt to criticise their fellow referees regarding decision making and bias.

7.2 Method

7.2.1 Participants

11 elite football referees' questionnaire data were acquired along with 183 county level referees' data. The elite level referee sample comprised only Premier League referees, hence the small number obtained in the study. Approximately 70% of the Premier League referees agreed to participate in the study. Obtaining a sample of elite levels referees as a comparison to county levels referees is extremely pertinent as they are a highly unique group. Elite referees' mean age was 39.45 years, SD = 6.65 and their mean years as an official was 19.64 years, SD = 3.93. County referees' mean age was 37.68 (SD = 15.58) and their average years as an official was 8.82 (SD = 9.46). Combined referees' mean age was 37.78, SD =

15.21, and combined average years as an official was 9.28, SD = 9.54. Overall, across groups referees were charged with approximately 4.58, SD = 2.56 games per month.

7.2.2 Materials

A four page questionnaire (See Appendix D) was developed to assess referees' perceptions of the home advantage. The questionnaire contained items pertaining to factors which could affect match officials during a competitive game. The first section of the questionnaire focussed on biographical information from the referees such as their age, gender, leagues officiated in, how long they had been an official, and approximate games refereed per month. The second section consisted of a series of open-ended questions asking referees at which ground they most and least liked to officiate. These open-ended questions acted as buffer questions that preceded the main questions which were the intended focus of the study.

The third section focussed on levels of superiority and asked referees to compare themselves to their fellow referees with the following statement "*to what extent do you feel the following during the match*" responses were on a 7-point Likert scale. Referees were asked to indicate whether they thought they were the *same as other officials* (neutral point score 4), *less than other officials* (score 1-3) or *more than other officials* (score 5-7). They were given ten items consisting of positively (assertive, confident, decisive etc.) and negatively (anxious, under pressure etc.) worded adjectives.

Two sections were also devoted to finding out about influence asking "*When I am the main match official, I think that I am...*" These items had a Cronbach's α of .70 and referees were also asked "*When a typical official operating at my level is refereeing a match I think...*". These two statements pertaining to views about themselves and their fellow referees were then followed by a series of adjectives relating to the factors which comprise the home advantage (influenced by the home crowd, biased towards the home

team, concerned about making key decisions etc.). Responses were based on a 7 point Likert scale (1 not at all to 7 extremely, with 4 as the neutral point).

Lastly, referees were given four football scenarios with the following preliminary statement *“please imagine that you are officiating at a game where the following have occurred, and rate how each one might influence your decisions during the game”*. Referees were then given scenarios (*the home crowd are booing a decision that I have just made, the majority of the home crowd have shouted “handball” before I have made a decision, the home manager is verbally expressing anger towards me and the home players are surrounding me and questioning a decision I have just made*). The items were scored on a 7 point Likert scale whereby referees were asked to respond if they would which was sectioned into making a decision in favour of away team (score 1-3) not at all influenced (neutral 4) and making a decision in favour of the home team (score 5-7).

7.2.3 Procedure

Permission was granted from Professional Game Match Official Limited (PGMOL) to contact the elite referees with regards to completing the survey. The questionnaires were kindly distributed by the sport psychology consultant who works with the elite referees. For the county referees permission was granted from several County Football Associations who were contacted with regard to their registered officials completing an online version of the questionnaire. The County Football Associations distributed emails and survey links utilising SurveyMonkey, an online survey generator which detailed the study to potential participants.

Participants were briefed with the following statement prior to their study commencement *“The aim of this study is to investigate how LEVEL and EXPERIENCE of officiating affects officials' perceptions of the impact of a football venue. If you volunteer to participate you will be asked to complete an anonymous questionnaire. Your name will not be taken, and you may leave blank any items you do not wish to answer. This project has received ethical clearance via the Psychology and Sport Sciences Ethics Committee at*

Northumbria University". In the case of the online survey, participants then had to check a box indicating that they had given their consent before the online survey generator would allow them to continue with the questionnaire. The referees were instructed that feedback about the general results of the project would be emailed or in the case of the elite referees provided to them at future referee training session. Finally, space was left on the questionnaire for the referees to provide any additional comments regarding their answers or give any additional thoughts on why the home advantage occurs.

7.3 Results

7.3.1 Superiority

An overall superiority score was created by calculating the overall mean of the items, using reverse scoring for the negatively-worded items. An independent t-test revealed no significant difference between premier ($M = 5.36$) and county ($M = 4.95$) referees. However, one-sample t-tests showed that both premier ($t = 5.95$, $df = 10$, $p = .000$) and county referee groups ($t = 15.14$, $df = 171$, $p = .000$) scored significantly higher on superiority when compared to the theoretically neutral point of 4. Individual item mean scores, standard deviation and significance levels for referee groups are shown in Table 7.1

Pearson correlations were also computed and showed significant positive relationships between age and superiority ($r = .19$, $df = 183$, $p = 0.05$) and years as an official and superiority ($r = .34$, $df = 179$, $p = .001$).

Table 7.1 Mean (SD) for superiority items

Item	Elite Referees		County Referees	
	Mean (SD)	Significance	Mean (SD)	Significance
Assertive	4.73 (1.01)	.038	4.82 (1.21)	.000
Anxious	2.45 (1.13)	.001	3.19 (1.51)	.000
Under Pressure	2.82 (1.25)	.011	3.58 (1.47)	.000
Confident	5.55 (.52)	.000	5.08 (1.17)	.000
Apprehensive	2.73 (1.19)	.005	3.45 (1.33)	.000
Decisive	5.18 (1.08)	.005	5.06 (1.16)	.000
Positive	5.82 (.75)	.000	5.21 (1.18)	.000
In Control	5.45 (.93)	.000	5.23 (1.09)	.000
Well Prepared	5.55 (1.37)	.004	5.01 (1.23)	.000

7.3.2 Influence

An Influence measure was calculated and analysed by a 2x2 mixed ANOVA varying target (self, other) as the repeated measures factor and level (premier, county) as the independent factor. Results revealed a main effect for target ($F_{1,167} = 6.30$ $p = .013$), with referees rating themselves ($M = 1.78$) as less influenced than other referees ($M = 2.33$). There was also a main effect for level ($F_{1,167} = 6.01$ $p = .015$), with Premier referees ($M = 1.37$) significantly lower than county referees ($M = 2.10$). There were no other significant effects.

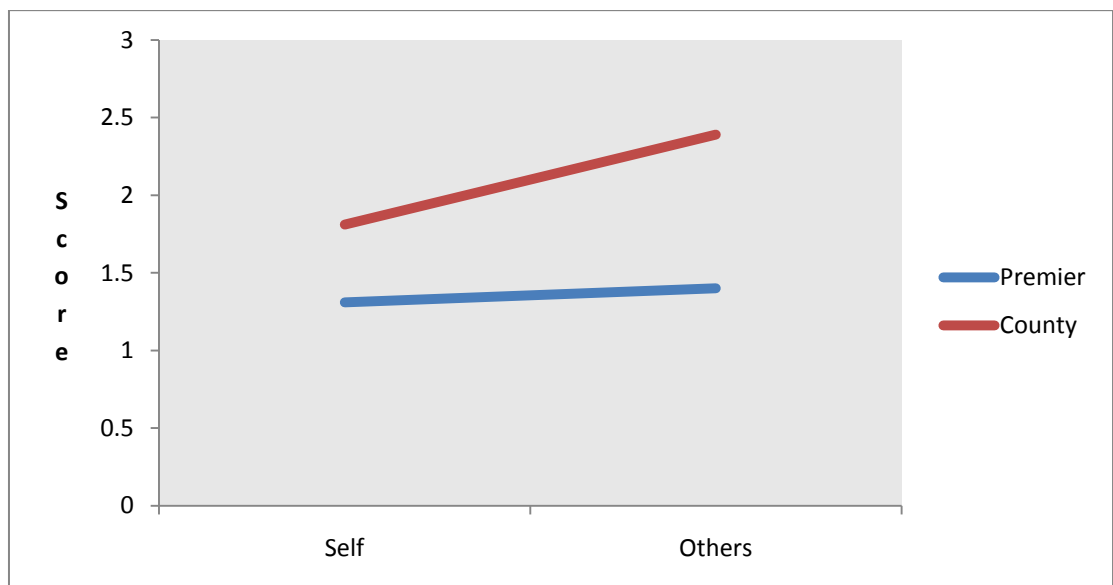


Figure 7.1 Main effect showing Premier and County league officials responses on influence

7.3.3 Officiating Scenarios

Referees were given four scenarios that they could be faced with in a game situation and were subsequently asked to make a decision on how they would be influenced. The referees could respond on a 7-point scale in terms of having their decision influenced in favour of the home team (score 5-7) or away team (score 1-3) or not being influenced at all (score neutral 4).

A two-way repeated measure ANOVA was conducted on the county v elite referees on the scenario data (*home crowd booing, home crowd shout handball, home manager expressing anger, home players surrounding*). Results revealed no differences between elite and county referees. The absence of differences between groups occurred largely due to elite referees selecting the theoretically neutral point of 4. The only slight deviation from the neutral point occurred for *crowd shout "handball"* ($M = 4.09$). However, when elite and county referee data were combined using a one way ANOVA there was a significant main effect for scenario ($F_{1,186} = 15.94$ $p = .000$).

A further one way repeated measures ANOVA was conducted on the county referee data varying scenario (*crowd booing, crowd shout offside, manager angry and players surrounding*) was conducted. Results revealed a significant effect ($F_{1,175} = 16.50$, $p = .000$). Post hoc comparisons adjusted with the Bonferroni correction revealed that the county referees were significantly higher (at home) on the *crowd shout offside* scenario than each of the other three scenarios, which did not differ from each other.

One sample t-tests were also conducted on county referee data for the individual scenario items against the theoretically neutral point of 4 and revealed significant differences for *crowd shout offside* ($t = 3.75$, $df = 175$, $p = .000$), *manager angry* ($t = -3.68$, $df = 175$, $p = .000$) and *players surrounding* ($t = -3.88$, $df = 175$, $p = .000$). However, the item pertaining to *crowd booing* was not significant ($t = -1.68$, $df = 175$, $p = .094$). Means for the individual items revealed that for the *home crowd booing* ($M = 3.92$, $SD = .627$), *manager*

expressing verbal anger ($M = 3.78$, $SD = .563$) and home players surrounding ($M = 3.78$, $SD = .757$), decisions were in favour of the away team (score significantly lower than 4). The only scenario where referees indicated that they would be influenced in favour of the home team (score significantly higher than 4) pertained to the item *home crowd shouting “handball”* ($M = 4.16$, $SD = .563$).



Figure 7.2: County referee scenario mean scores

7.4 Discussion

It has been determined that referees are subjected to enormous pressures on the football pitch which come from a variety of sources including managers, players and the crowd. The perceptions of why teams can gain an advantage when playing at home has been explored from the viewpoint of county and elite referees in the current study. It was envisaged that the results obtained would extend previous findings and discover whether results could be generalised across level of referee irrespective of their levels of experience. It was also considered that the results would reflect the previous findings of Wolfson and

Neave (2007) who observed in their sample of referees an illusory superiority effect coupled with deflection of blame.

The results have indicated that football officials are individuals high in confidence and self esteem irrespective of the refereeing standard. Both Premier League and county referees regarded themselves as superior, with no differences observed between the referee groups. The findings support Wolfson and Neave (2007) who found a superiority effect, and suggest that characteristics such as assuredness may be traits that are inherent in the individuals who are attracted to refereeing. In addition, the present findings also extend the notion that both Premier League and county referees, though operating at a different standard, display an overall illusory superiority effect. The results suggest that referees in general believe that they are more confident, decisive and assertive than other referees operating at their level, with no observed differences found between levels suggesting that this could be related to global-self evaluation. This is also consistent with the explanations given by Taylor and Brown (1988; 1994) who stated that individuals can filter information and distort it in a positive direction, which can be particularly useful with regards to experiencing negative feedback. With specific regards to the county referees the data indicate that county referees regard themselves as superior to their fellow county referees, rating themselves higher on positive aspects of the game whilst in turn rating themselves as having fewer negative attributes and feelings than their fellow referees. This demonstrates that the referees were good at discriminating between positive and negative aspects within the game, aiming to distance themselves from the attributes that could lead to potential criticism. Referees displayed in their results levels of acquiescence where they agreed with statements that had positive connotations and dismissed those with negative connotations; however, this self-preservation was not extended to their refereeing counterparts. Illusory superiority has been used to describe such a view; this can assist an individual's ability to filter out negative information and distort it into something more positive (Taylor & Brown, 1988). Buunk and van der Eijnden (1997) also found that individuals tend to have higher regard for themselves than of others and superiority was more pronounced with regards to the "typical average

adult” rather than “most others” this may be the case in the present research as referees were asked to compare themselves to other referees operating at their level, illustrating the illusory superiority effect.

Interestingly, a positive correlation was also found with regards to higher superiority with referees’ age and years as an official. Although it is unknown if any other study has similar findings in relation to superiority, differences in referees’ experience levels have previously been found in relation to coping with aggression. Folkesson et al. (2002) reported that factors such as pre-match worry, effects on concentration, motivation and performance were affected by threats of aggression. These outcomes were subsequently affected by age and experience, with younger referees more prone to threat and aggression. The authors stated that although results were non-significant, this factor was due to less match experience. In the current experimental study the age of the elite and county level referees were comparable, however county referees were not as experienced in comparison to elite referees who had greater number of years as a referee.

The influence measures revealed that county referees saw themselves as far less influenced by external factors than their fellow county referees, and these results provide support for Lewicki (1983) who reported that people inherently differ with regards to their self-image which in turn causes differences in their perceptions of other people. Furthermore, the author found that self-image bias reflected a defence mechanism to preserve high self-evaluations. In the present study it seems that county referees are maintaining their own positive self-perceptions by deflecting blame upon others. It has also been reported from Major, Kaiser and McCoy (2003) that discounting personal responsibility and re-attributing blame helped protect an individual’s emotions and personal wellbeing. In contrast, elite referees did not view themselves any differently to their fellow referees. This emerged as elite referees did not depart from the neutral point of 4 on a 7 point Likert scale. The absence of any influence admissions by the elite level referees could possibly serve as a protective mechanism to avoid potential criticism. Wolfson and Neave (2007) alluded to this when they stated that referees employ coping mechanisms to enhance self-esteem and also to help

resolve the mismatch between perceived competence and criticism. The referee scenario section has also highlighted item endorsement differences between the elite and county referees. Although there were no statistical differences apparent, the results do allow an inference in that elite referees are reluctant to endorse any favouritism to either the home or away side. Elite referees selected the neutral point of 4 for every scenario, whereas, the county referees were more open to selecting choices in favour of the home or away side. It has been suggested that referees will aim to avoid certain stressful situations which could result in decisions in favour of the home team to avoid conflict (Kaissidis-Rodafinos, Anshel & Porter, 1997). However, with the county referee scenario sample it seems they overtly want to displease the home crowd during specific events within the game by penalising the home side. Previous evidence has reported that the crowd can have an effect on referees' decision making, although elite referees see themselves as impervious and unaffected by external agencies. Again this could be described as a defence mechanism adopted to maintain reputation and avoid further and future conflict, whereas county referees may not have as much at stake and may be more willing to divulge their true feelings, as they are not subjected to the same amount of scrutiny.

The findings associated with the elite referees and their subsequent disassociation with influence could also be indicative of positive illusions. It has been reported that individuals tend to have a positively skewed perception of themselves compared to others. Moreover, from adopting positive illusions of the self and personal control this can be adaptive in circumstances of adversity, for example depression or lack of motivation (Taylor and Brown, 1988). The authors have also reported that if individuals perceive themselves as competent and efficacious with a positive view of the world, this will subsequently lead to increased competence in overcoming setbacks and potential damage to self esteem. It is possible, therefore that elite referees because of the associated merits in refereeing Premier League games do actually believe they are invulnerable and subsequently not influenced by external factors.

The influence or presence of heuristics on referees has also received research attention and provides an additional explanation in the current work. Tversky and Kahneman (1974) have stated that in general individuals rely upon a number of heuristic principles to make complex judgements simpler which in turn can lead to systematic bias. It has been reported that a football referee may rely on the salient but biased reaction of a crowd (Nevill, Balmer & Williams, 2002). Souchon, Cabagno, Traclet, Trouilloud and Maio (2009) reported that competition heuristics affected handball referees decisions where more prestigious competitions were associated with different disciplinary decisions. This is in contrast with the current elite referee sample who did not believe that they were influenced by external factors.

County referees in the present study have indicated, albeit with a small differentiation in scores, that when faced with certain scenarios they may actively penalise the home side. This was specifically apparent with the player and manager scenarios. This finding is pertinent due to the recently launched FA Respect campaign, whereby players and managers are encouraged to behave appropriately towards the referee. Therefore, referees have possibly decided to act against players and managers who display aggression by awarding decisions against them. Only one scenario item revealed a decision in favour of the home team which pertained to *if the crowd shouted "handball"*. It is conceivable in the current study that county referees can be influenced by informational processing and that crowd pleasing can be ruled out. From indicating that informational cues can influence decisions county referees display honesty and self-insight. The current scenario findings, although based on a small differentiation in scores is supportive of Nevill, Balmer and Williams (2002) who found that the presence of crowd noise had an effect on the decisions made by referees. The authors concluded that referees could be influenced by the salient nature of crowd noise and that they may seek to avoid potential crowd displeasure by making decisions in favour of the home team. A related study conducted by Balmer et al. (2007) reported a significant relationship between referee decision bias and increases in cognitive anxiety and mental effort in relation to crowd noise. The authors highlighted that referees attempted to cope with increased

anxiety levels by making decisions in favour of the home side. In light of the current experimental work the distinction between informational processing and crowd pleasing factors is one which needs to be further addressed.

It seems that for county referees, heuristics may influence their decision-making although this may not always have the desired effect for which the crowd aims. For example, in the scenarios relating to the home crowd, county referees indicated that decision relating to a call of “handball” were most likely be given to the home team. However, in instances where the home crowd were booing, decisions were most likely to be made in favour of the away team. These findings partially support the role of heuristics whereby county referees seem to pay attention to auditory information as well as visual information. However, the elite Premier League referees claim to be unaffected. This notion of decisions going against the home crowd partially supports research pertaining to the home disadvantage; whereby a partisan crowd can have a potentially negative impact on their team (Baumeister & Steinhilber, 1984; Wallace, Baumeister & Vohs, 2005) However, this research was concerned with the crowd building too much pressure which was detrimental to the home team rather than the crowd negatively persuading the referee to act against the home team. Perhaps, county referees are willing to accept the partisan nature of the crowd but this acceptance is not extended to managers and players. However, it should be noted that the scenario findings in the current experimental work should be viewed with some caution as although significant differences have been found, when the results are viewed on a complete 7 point Likert scale the differences seem relative; mean scores that were obtained in the present study only showed a slight deviation away from the neutral point of 4.

In summary, the results outlined in this chapter suggest that referees irrespective of their level regard themselves as more superior than their fellow referees. From acting in this way it may facilitate the removal of potential negative stressors which may be attributed to their performance. In addition, externalisation and feelings of superiority can help to enhance and maintain referee confidence. In terms of influence it seems that county level referees were comfortable passing blame to their counterparts whilst elite referees were not. The

current experimental work provides support to referees adopting illusory superiority and self-serving bias. Research has suggested that this can act as a coping mechanism to potential stressors and instances which can lead to damaged self-esteem. The adoption of positive illusions was certainly apparent within the elite referee sample who disassociated themselves away from being influenced. Elite referees absolving themselves from influence can be explained two fold; firstly elite referees are considered the best referees in England, are at the top of the referee hierarchy and subsequently view themselves as invulnerable to any external factors. Secondly, elite referees, of all referees, are under increasing pressures stemming from managers, players, fans and the media. Any admission of blame could draw unwanted attention, be detrimental to the referees' reputation and draw further scrutiny to match referees.

The current chapter highlights the integral relationship that the referee has within the game. It also reveals the individual differences between the various refereeing levels and the accompanying differences between levels of superiority and influence. Future research should perhaps encompass qualitative methodologies whereby, focus groups could be utilised to facilitate discussions pertaining to referees' perceptions. These perceptions could include aspects pertaining to superiority, self-serving attributions and influence, namely if referees are subconsciously influenced by particular teams and players. This is a premise that was suggested by managers and players in the previous interview study. In addition, it is necessary to determine which factors referees perceive as the most influential in the home advantage, and subsequently whether they identify themselves as having a role in it.

7.5 Conclusion

In conclusion, the present study provides support for the work conducted by Wolfson and Neave (2007) with evidence of superiority even amongst a county referee sample. The findings also highlight the need for referees to protect themselves from potential sources of stress which could emerge as a result of referee bias, hence neither group admitted being

influenced. The findings suggest that referees do not see themselves as implicated in the home advantage, which is in contrast to what some previous research has suggested. It would now be beneficial to determine how referees do explain the home advantage. Their perceptions of the most commonly cited explanations of the home advantage such as familiarity and travel, compared to their own role, will thus be examined in the following study, with comparisons made with players' and fans' perceptions of the same factors.

Chapter 8

Points of View

Players', Referees' and Fans' Perceptions of the Home Advantage in Football

“It can be a bit of a hindrance when you walk into a restaurant for a quiet meal and one or two launch into 'Psycho, Psycho!'”

Stuart Pearce

Chapter 8: Points of View: Players', Referees' and Fans' Perceptions of the Home Advantage in Football

8.1 Introduction

Previous experimental work conducted in this thesis has ascertained football players' and managers' perceptions of the home advantage. Football referees' perceptions of their potential contributory role in influencing the home advantage have also been explored. These perceptual differences in previous studies were explored using a mixed methodological approach combining qualitative data in the case of managers and players as well as quantitative data as in the case of referees. The experimental studies conducted so far have provided a unique multi-perceptual insight into the home advantage in football. However, the studies have tended to focus on individual group perceptions rather than a collective approach.

The current experimental study will examine the home advantage in football using a collective multi-perceptual approach. Football referees', players' and fans' perceptions of the home advantage will be studied. The inclusion of football fans, a previously unstudied group in the current experimental work, will provide a more holistic perceptual overview of the home advantage. This will subsequently allow for comprehensive comparisons between groups to be generated. More specifically, this study aims to determine any perceptual differences among the three groups related to previously determined factors that have been used to explain the home advantage. Chapter 8 also aims to extend the current sparse literature base pertaining to football players', referees' and fans' perceptions of the home advantage.

Pollard and Pollard (2005a) reported from a statistical analysis that the home advantage in football was evident as early as the 1888-1889 season. The home advantage in football was initially considered by Dowie (1982) who studied the World Cup and identified familiarity, fatigue and fans as the main factors influencing the home advantage in football.

Home advantage research has progressed since, and Pollard (1986) subsequently identified from English and European football data the additional contributory factors of travel, crowd, referee bias, familiarity, tactics and various psychological factors. More recently, further contributory factors in football have been identified: the issue of team quality has been raised as another possible issue when considering the home advantage in football (Barnett & Hilditch, 1993; Clarke & Norman, 1995), as has the role of referees and their contribution (Nevill, Balmer & Williams, 2002), and more recently the notion of a territorial response to playing at home with regards to increased testosterone levels (Neave & Wolfson, 2003) has been suggested.

Although a well established statistical literature base exists in support of the home advantage pertaining to individual and teams sports, there still remains a sparse amount of literature dedicated to exploring the perceptual nature of the home advantage. This scarcity of research pertains not only in the football domain but also across all sporting literature. Bray and Widmeyer (2000) provided one such study when they examined perceptions of the home advantage in basketball. Basketball players completed questionnaires and reported familiarity with the home court, home crowd and travel as the most important game location factors. Moreover, in terms of team performance the players identified that familiarity of the home court and support of a home crowd had the greatest influence. Perceptions of the home advantage have also been obtained from coaches who identified site familiarity as the major contributor to the home advantage. There were no differences obtained, however for travel, social support, official bias and self-fulfilling prophecy (Gayton, Broida & Elgee, 2001).

The most comprehensive study of perceptions to date was conducted by Waters and Lovell (2002) who examined the home advantage in English football players. They adopted a triangulated approach. Phase one of their research focussed on retrospective analysis of players' perceptions and revealed significantly higher perceptions of confidence and positivity of playing at home. Phase two concentrated on the qualitative aspect of the home advantage whereby players identified physical and mental preparation, sleep, crowd and referee bias as the main themes which emerged from the interviews. It has been further

suggested that crowd, referee bias, familiarity, travel and fatigue could have a direct impact upon competitors' personal expectation with regards to being at an advantage at home and a disadvantage away from home (Neave & Wolfson, 2004).

Wolfson, Wakelin and Lewis (2005) have examined football supporters' perceptions of the home advantage and reported that fans perceived they helped their team by inspiring to victory, distracting opponents and influencing the referee to make decisions in favour of their team. Fans also distanced themselves from having any personal blame for their team's poor performance. A perceptual study has also been conducted on football referees and although the study did not specifically pertain to the home advantage, referees did indicate that they expected to be subjected to dissent from players, managers and fans (Wolfson & Neave, 2007).

The data from the aforementioned studies provide support for many of the previously established home advantage factors discussed in Chapter 2. Previous experimental studies indicate feelings of territoriality; hormonal differences in relation to venue and superiority in football officials irrespective of level. It is envisaged that in the current study players, managers and referees may display an element of egocentric bias in their choice of explanations. Egocentric bias pertains to individuals tending to see themselves as both the cause and target of another's behaviour (Zuckerman, Kernis, Guarnera, Murphy & Rappoport, 1983). Burger and Rodman (1983) in their study reported from three experiments found that under certain conditions participants working in a dyad attributed greater responsibility to their partners for a positive outcome rather than themselves. However, the authors also reported that participants attributed greater responsibility to themselves when making the attribution three days later. These findings suggest that memory distortions of past events are likely to support egocentric attributions.

8.1.1 Study Rationale

This final study aims to examine referees', fans' and players' perceptions of the home advantage, factors that have been identified thus far. It is envisaged that examining the home advantage using a multi-perceptual viewpoint will produce a more holistic view of the home advantage; this may further enhance home advantage understanding and determine any similarities and differences in perception between the groups. This also aims to fill a void in the home advantage literature which until now has only focussed on one sports personnel group rather than a collective approach. It is hypothesised that players, fans and referees will view the crowd and familiarity as the most influential factors involved in the home advantage. It is also envisaged that players and fans will implicate the referee in the home advantage whilst referees will deflect blame from themselves.

8.2 Method

8.2.1 Participants

The sample comprised 373 male and female participants of targeted football personnel consisting of 94 players ($M = 17.38$, $SD = .80$), 163 referees ($M = 37.78$, $SD = 15.21$) and 116 football fans ($M = 31.67$, $SD = 10.23$). The mean age for all participants was 34.44 years, $SD = 14.18$. Players were recruited primarily from Northern professional football academies but data also included non-league team data and data obtained from a professional women's team. Elite and county referees who had completed the questionnaire outlined in Chapter 7 were also asked to complete the current survey in addition and were demographically spread across the UK. Football fans that supported varying teams were also asked to complete the survey and were demographically obtained from North East England.

8.2.2 Materials and Procedure

A ten item questionnaire was administered to the groups either using paper and pencil methods or the online survey generator SurveyMonkey. The method chosen for survey distribution was dependent largely on gaining access to the particular groups. Ethical approval was granted by the School of Psychology and Sport Sciences Ethics Committee at Northumbria University prior to questionnaire distribution. In addition, player participation approval was granted from football clubs. The questionnaire (See Appendix E) comprised items relating to previously identified home advantage factors pertaining to the crowd, players and referees. Responses were scored on a 7 point Likert scale ranging from 1 not at all to 7 extremely, with a Cronbach's alpha score of .79 for questionnaire items.

8.3 Results

A MANOVA was carried out on the questionnaire data with role (player, referee, fan) as the grouping variable and the 10 questionnaire items as multiple dependent variables. Using Pillai's trace criterion, results revealed a significant main effect for role on the home advantage factors ($V = 0.37$ $F_{20,724} = 8.14$, $p = 0.00$). Pairwise comparisons also revealed significant differences between groups (See Table 8.1) with referees differing from players and fans for 7 out of the 10 factors. The items where referees differed from players and fans pertained to all referee items and the *away players have had to travel* statement. Separate univariate ANOVA were conducted and revealed a non-significant trend for the item pertaining to familiar environment ($F_{2,370} = 2.70$ $p = .068$). The mean scores for players, fans and referees are provided below (see Table 8.1).

Although the MANOVA revealed significant differences, Box's M Test of equality of covariance matrices was significant ($p = 0.00$). Thus, in order to address this violation and increase the robustness of the analysis Kruskal-Wallis statistical analyses were additionally conducted. The non-parametric Kruskal-Wallis test supported the MANOVA results with the

exception of a significant finding for *familiar environment* ($H(2) = 7.40, p = .025$); this item had previously displayed a non-significant trend in the initial MANOVA. Three Mann-Whitney tests were subsequently conducted for post hoc comparisons within the three groups and were adjusted using the Bonferroni correction. Overall post hoc results supported the previous MANOVA findings. However, there were two further differences between player and fan for *familiar environment* ($U = 4328, z = -2.90, p = .012$) and also for *home players protective over their environment* ($U = 4417, z = -2.63, p = .024$).

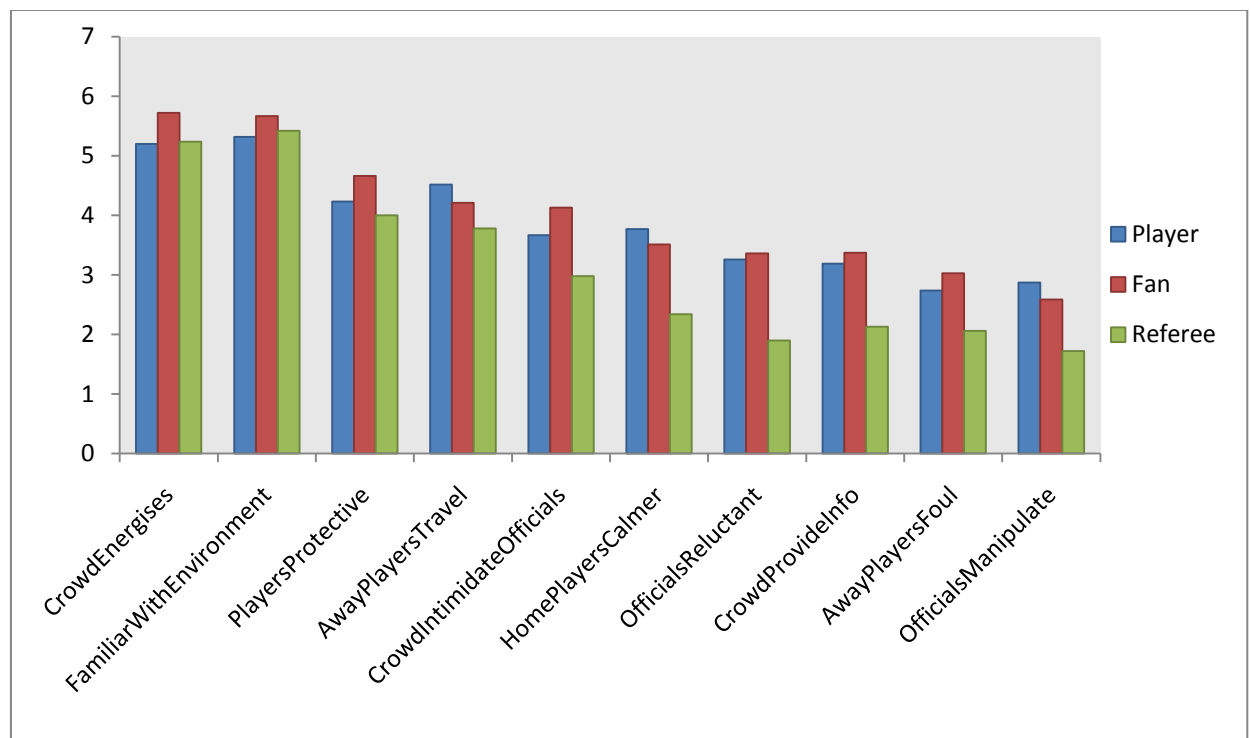


Figure 8.1: Mean home advantage perception scores for players, fans and referees

Table 8.1: Pairwise comparisons for MANOVA (Mean and SD)

	Player (N=94)	Fan (N=116)	Referee (N=163)	F
The home crowd energises and motivates the players	5.20 _a (1.14)	5.72 _b (.94)	5.24 _a (.1.46)	6.29 p=.002
The home players are more familiar with the environment	5.32 _a (.98)	5.67 _a (.93)	5.42 _a (1.38)	2.70 p=.068
The home players feel more protective over their territory	4.23 _a (1.20)	4.66 _b (1.51)	4.00 _a (1.71)	6.19 p=.002
The away players have had to travel	4.52 _a (1.35)	4.21 _a (1.60)	3.78 _b (1.66)	7.11 p=.001
The home crowd intimidate the officials	3.67 _a (1.39)	4.13 _a (1.50)	2.98 _b (1.53)	21.15 p=.000
The home players are calmer and more controlled than the away team so commit fewer infringements	3.77 _a (1.24)	3.51 _a (1.50)	2.34 _b (1.59)	35.20 p=.000
The officials are reluctant to call a foul or penalty against the home team	3.26 _a (1.53)	3.36 _a (1.52)	1.90 _b (1.34)	43.95 p=.000
The home crowd provide information to the officials about what has happened, as in “Handball”	3.19 _a (1.36)	3.37 _a (1.41)	2.13 _b (1.32)	33.85 p=.000
The away players are more likely to commit fouls so are booked more	2.74 _a (1.24)	3.03 _a (1.39)	2.06 _b (1.35)	19.43 p=.000
The officials want to manipulate the home crowd	2.87 _a (1.29)	2.59 _a (1.22)	1.72 _b (1.20)	31.51 p=.000

*Subscripts indicate differences between groups (same subscript, no differences)

8.4 Discussion

The present study aimed to compare players', referees' and fans' perceptions of the home advantage. The three groups were asked to rate ten of the most widely cited factors pertaining to the home advantage such as crowd influence, familiarity and the impact of the referee. It was envisaged that results would reveal perceptual differences between the groups. Moreover, based on previous research in the area it was thought that fans and players would endorse the role of the crowd and venue familiarity. However, it was suggested based on previous experimental studies that referees would actively distance themselves from items

specifically pertaining to the referee. As a result it was also thought that referees would endorse the role of the crowd and familiarity due to the external nature of the factors.

The results did indeed indicate perceptual differences between players, fans and referees. However, these perceptual differences emerged more specifically regarding the referee. Fans tended to be closer in agreement to players for most factors except on crowd energises where fans placed a slightly higher emphasis on this factor. This also corroborates the previous findings of Wolfson, Wakelin and Lewis (2005) where football fans identified that they were responsible in inspiring players to victory, distracting opponents and influencing officials. Highly identified fans are also known to have a strong sense of association, a desire for positive outcomes, and a dislike of their rivals (Shank & Beasley, 1998; Wann & Branscombe, 1993). The present finding has also been supported by Smith (2005) who reported from media narratives and fan websites that fans viewed crowd support as the main factor in the home advantage. Additionally, the author reported that neither the media nor the fans offered a critical view of what could produce the home advantage, where they tended to resort to the influence of the crowd or the team overcoming a poor crowd.

The most prominent perceptual differences in the current study occurred regarding factors associated with officiating games. Referees scored lower on all of these factors when compared to fans and players. Referees in the present study have tended to externalise the home advantage factors and have steered away from implicating themselves as contributing towards it. Wolfson and Neave (2007) have also reported that referees expect to be censured by players, spectators and coaches, but attribute this censure to external attributions such as bias and lack of knowledge. The authors further stated that referees use a range of coping mechanisms to enhance self-esteem and the mismatch between their perceived competence and the criticism from others. This also seems to be supported in the current experimental work; referees are comfortable enough to identify familiarity and crowd support as factors which increase the home advantage although they seem to completely renounce any factor which could highlight their own contributory role. This also supports the experimental

findings in Chapter 7 where referees displayed heightened superiority over fellow referees and externalised any issues that were potentially damaging to themselves.

Players' perceptions also seemed to mirror those obtained from the fans; this supports the interview findings obtained in Chapter 6 from the professional managers and players. In the current study players identified crowd and familiarity as the major contributory factors pertaining to the home advantage. The current findings support those obtained by Gould et al. (1999) and Gould et al. (2002) where Olympic athletes identified the crowd as having a positive impact on their performance. The basketball players in Bray and Widmeyer's (2002) perceptual study also identified the home crowd and court familiarity as the major contributors. However, the authors noted that familiarity was deemed as slightly more influential by the players than by the crowd.

Travel issues have been frequently cited in the literature (See Chapter 2) as providing an explanation of why visiting teams may not perform so well. However, it is interesting to note that travel issues for the away team were barely endorsed by any of the three groups which is particularly surprising with regards to the players. The current findings are also in disregard to the perceptual findings obtained in Chapter 6 where players and managers stipulated that travel was a major cause of the home advantage. However, Pollard (1986) showed no differences in travel effects between teams more or less than 200 miles apart. This could provide an explanation of the current findings, as players who comprised the current sample were academy players and northern league women players, and they would not travel as far as professional teams.

Possible limitations of the present study pertain to the mixed methodological approach of combining paper and pencil and online versions of the questionnaire. Due to access issues of the intended groups it was not always possible to obtain face to face contact to distribute a paper and pencil questionnaire. Smith and Leigh (1997) have stated that internet surveys allow a vast amount of participants to be recruited in a timely and inexpensive manner. However, Stanton (1998) has reported internet surveys can lead to an unrepresentative population comprising the data. By combining methodologies a more

complete survey could be undertaken and allowed access to groups that would have been difficult with only paper and pencil methods such as with the referees. The final limitation of the study pertains to the statistical analyses employed and the violation of homogeneity in the MANOVA. The issue with homogeneity arose with the unequal samples sizes in the present study and Box's M test has been previously reported as a very strict measure of homogeneity (Tabachnick & Fidell, 2001). Pillai's criterion was utilised to evaluate the multivariate significance, this has also been considered as the preferred criterion for unequal sample sizes (Olson, 1979). The issue of homogeneity was further addressed by performing additional Kruskal-Wallis statistical tests for non-parametric data and further Mann Whitney tests for the post hoc comparisons which supported the results outlined in the MANOVA as well as clarifying marginal results.

As a whole the data obtained raise some interesting conclusions; although statistical differences were obtained between groups, the differences are somewhat relative. Data was collected on a 7 point Likert scale ranging from not at all (score 1) to extremely (score 7), however, none of the scores obtained reached the top of the scale and the highest average value obtained was 5.72. Future research could encompass questions which adopt a more indirect approach to examining perceived causes of the home advantage using vignettes. The groups could also be asked questions pertaining to the detrimental aspects of a team playing at home such as crowd pressure. Scenarios relating to the home advantage factors could be given rather than statements which may have a greater impact on scores selected as well as determining further relationships and differences between the groups.

8.5. Conclusion

The current study yields interesting findings between players, referees and fans, the insights gained provides further perceptual support to the home advantage. Results highlight the groups' perceptual similarities regarding the crowd and venue familiarity as the main contributors of the home advantage. However, the differences between the groups'

perceptions are also highlighted especially regarding the players and fans with the referee. The referees externalised factors which could have potential negative associations with themselves, where they avoided implicating themselves in the home advantage.

Chapter 9

Summary and Future Research Directions

"There's no in between - you're either good or bad. We were in between."

Gary Lineker

Chapter 9: Summary and Future Research Directions

9.1 Summary

The current thesis contributes to an already growing body of knowledge which has focussed upon the home advantage. More specifically, the hormonal aspect pertaining to the home advantage has been investigated and the findings expand upon previous research to date. The perceptions of playing venue have also been investigated utilising multiple agencies involved in football such as managers, players, referees and fans. It is envisaged that the current findings outlined in this thesis will contribute original knowledge regarding hormones and perceptions to existing literature in the home advantage. The following epilogue will summarise the work conducted in the thesis and evaluate its impact upon the home advantage. Future research directions stemming from the current experimental studies will also be discussed. Chapters 1 and 2 centred upon establishing a rationale and reviewing the literature around the home advantage and hormonal responses. From the review of literature it was clear that the home advantage was a complex phenomenon encompassing many factors. Literature pertaining to the role of hormones and the home advantage was also complex, with conflicting evidence provided from studies.

9.2 Study 1: Not On My Turf! Hormones, Territoriality and the Home Advantage in Academy Football

In Chapter 3 the impact of hormones on home advantage was studied in relation to male academy players from a professional football team. The finding of a hormonal effect on venue for testosterone was previously reported in football players by Neave and Wolfson (2003), who reported increased testosterone levels prior to a home game. Carré et al. (2006) extended these findings in ice hockey players with the addition of cortisol where the authors noted higher levels were evident at home; this was also the same for testosterone. In the present study under-18 football players provided saliva samples pre-game and post-game for

three home games and three away games. One baseline post-training measure was also obtained. The saliva samples were then analysed for the presence of two hormones, testosterone and cortisol. Testosterone results obtained for the study revealed no overall venue effects; however, positional differences in the data set were examined and revealed significantly higher testosterone levels for defenders as opposed to midfielders and forwards, consistent with previous research by Neave and Wolfson (2003). In contrast to testosterone there was a venue effect obtained for cortisol with significantly higher post-game levels at home. The study did not reveal any differences in rivalry, and performance-related coach ratings did not display any relationships with the hormonal findings. The main methodological issue to arise from this study pertained to the training measure that was undertaken; only one training measure was obtained and this was problematic due to the fact that the players had previously trained before sampling occurred. This factor was addressed in subsequent studies in order to determine baseline changes. Another issue was that the team being studied were on a winning streak and won every game that was studied which was envisaged to have had possible implications on the hormone levels collected. Previous research has suggested that hormone levels can remain elevated following a victory which may have affected the hormonal values obtained.

9.3 Study 2: The Home Guards: Testosterone and Cortisol Responses to Playing Venue in Male Football Players

Chapter 4 aimed to extend the previous findings of those obtained in Chapter 3 with an emphasis placed upon exploring players' feelings prior to playing a game. Players recruited for this study were older than in the previous and also played in a different league. They completed psychological mood measures and Marteau and Bekkers's (1992) short form of Spielberger's State Anxiety Questionnaire. Two opposing teams were selected for the study encompassing a major and moderate rival, with each game played at home and away. As with the previous study there were no venue effects for testosterone, although a

marginally significant interaction emerged regarding positional differences, which were categorised as offensive and defensive. The marginal interaction revealed that defensive players post-game testosterone levels were higher than the offensive players. Although there was a trend with the positional difference paired sample t-tests did not corroborate these differences. In contrast, a main effect for time was found for cortisol, with post- game levels higher than pre-game levels. There was also a significant interaction for venue and time with significantly higher post-game cortisol levels observed at home. There was also a significant interaction found for rivalry with significantly higher post-game cortisol levels observed at home against the major rival, although this only comprised five players' data sets; there were no main effects for rival, venue or time. In concurrence with the previous study, hormones did not correlate with the mood and anxiety measures which had been attained from the players and not coaches in this instance.

9.4 Turf Wars! Does Playing Venue Affect Testosterone and Cortisol Responses in Male Academy Players?

Chapter 5 aimed to extend and replicate the findings presented in Chapter 3 and Chapter 4; this chapter could also provide a direct comparison with Chapter 3 as the football players involved were also academy players, though in a different cohort. Three teams were selected as opposition and included a major, moderate and minor rival. Coaches again provided performance-related measures for players giving a score for performance and mental state for every game played. Testosterone results revealed a non-significant trend for venue and a main effect for time, which mainly evidenced higher post-game testosterone levels at home. There were no training, positional or rivalry differences evident. Cortisol data displayed no main effects for venue, although as with previous studies there was a main effect for time. There was also a significant venue by time interaction with higher post-game cortisol levels at home. As with the testosterone findings outlined above, there were no positional or rivalry differences amongst the data set. Coach ratings on game performance

also failed to exhibit any relationships with the hormonal findings, which has been corroborated in previous experimental chapters.

9.5 Hormones and the Home Advantage: The Conclusions

Three studies in the current thesis have been devoted to the investigation of hormones and the home advantage in football. Two studies have encompassed academy players of approximately 18 years old and a third Northern League football team where the players were somewhat older, with an average age around 23 years. The three chapters have cumulatively extended the previous literature pertaining to the home advantage in football.

The results obtained pertaining to testosterone have been somewhat variable, with mixed findings regarding venue, time, rivalry and playing positions. Chapter 3 highlighted positional effects for defenders and no overall venue or time effects, and this was largely replicated in Chapter 4 with a marginally significant trend regarding defensive players who had significantly higher testosterone levels before a home game in comparison to midfielders and forwards. Chapter 5 revealed a non-significant trend for testosterone for venue and a main effect of time with significantly higher post-game testosterone levels at home. There were also no rivalry or positional effects. Cortisol results also displayed a main effect for time with significantly higher post game levels irrespective of venue. There was no evident venue, rivalry or positional effects apparent.

There have thus been some underlying themes that have emerged regarding the data, especially in relation to cortisol, with higher post-game levels which have been related to venue (higher post game at home in Chapter's 3 and 4). This has occurred both for teams on a winning streak and on a losing streak. An overall effect for cortisol was found in Chapter 4 with higher post game levels evident both home and away. The implications of these findings suggest that a combination of psychological and physical exercise effects are apparent in the current studies. The issue of teams on winning and losing streaks in the current thesis also

adds a unique insight to the existing literature base; it is unknown if any other previous hormonal study related to sporting competition has had the opportunity to find this.

Table 9.1: Outline of Main Hormonal Findings

Chapter/ Study	Testosterone Findings	Cortisol Findings	Additional Information
Chapter 3 Academy 1	<ul style="list-style-type: none"> • Positional effects with defenders levels higher • No effects of venue, time or rivalry 	<ul style="list-style-type: none"> • Venue effect with post game levels significantly higher at home • No rivalry or positional effects 	Won every game
Chapter 4 Blue Square North Team	<ul style="list-style-type: none"> • A marginally significant interaction for playing position with increased post-game levels for defensive players compared to offensive players • No main effects for venue or time 	<ul style="list-style-type: none"> • A main effect for time with post game levels significantly higher • A significant interaction for venue and time with higher post game cortisol levels at home compared to training and away games 	Lost every game
Chapter 5 Academy 2	<ul style="list-style-type: none"> • A non-significant trend for venue and a main effect for time with post-game levels significantly higher • No differences for position or rivalry 	<ul style="list-style-type: none"> • Main effect for time with post-game levels significantly higher • No venue, rivalry or positional differences 	Won every game except one away against major rival

9.6 Strictly Home Advantage! Football Managers' and Players' Perceptions of Venue in Football: A Qualitative Approach

The impact of hormones on the home advantage and the inter-relationship between these two had been well documented in the experimental chapters previously. In order to shed further light on this apparent relationship a greater insight was needed. Chapter 6 examined players' and managers' perceptions of the home advantage in football. It was envisaged that

employing a qualitative methodology would provide a more in-depth perspective of the mechanisms that impact upon the home advantage. This was also postulated to uncover any perceptions of physiological changes according to venue such as stress, anxiety and aggression. Semi-structured interviews were conducted with three players and six managers, all of whom had played football professionally in the past. The interviews provided an avenue to explore the home advantage perceptually allowing freedom of responses and also a first-hand account of playing at different venues; the rich data that arose from this could not have been achieved quantitatively. There was also a gap in the literature regarding perceptions of the home advantage in football with specific regards to players and managers. Indeed, relatively few perceptual studies existed from a qualitative and quantitative standpoint.

The main themes to emerge from the interviews centred mainly upon the previously known home advantage factors such as crowd, travel, familiarity and referee factors. In addition strong emphasis was placed upon psychological factors and also on territoriality, incorporating physiological response and ownership. Two previously unmentioned themes also emerged, and these were experience and control. The interviews gave a greater insight into the hormone data that had been found in previous experimental chapters as interviewees reported feeling an adrenalin “rush” or “surge” before playing. This suggests they may be consciously aware of hormonal changes before they play a game. Although testosterone and cortisol were not referred to by name, the reference that interviewees made to adrenalin could be due to it being one of the more well known hormones associated in the sporting world. The emergent theme of experience also provides an insight into the home advantage, with many interviewees suggesting that younger players are more affected by venue change. Control is another new emergent theme and this was construed as being positive or negative, for example having control over preparation and routine but not over aspects such as crowd, travel and referees. This suggests that perceived control can be a somewhat fluctuating factor.

9.7 Blowing the Whistle: County and Elite Football Referees' Perceptions of their Role in the Home Advantage

An underlying theme emerged from the interview data which centred upon the role of the referee in the home advantage. Many interviewees also commented that referees should be approached to determine how they perceive the home advantage. To address these issues county level referees were contacted and asked to complete an online survey conducted through SurveyMonkey, an online survey generator. It was necessary to conduct the survey in this manner as referees are sparsely located across the UK, and by employing this methodology a greater demographic scope and increased access could be obtained. Most of the research that has been conducted with referees places emphasis on bias.

The present study aimed to investigate superiority, bias in decision-making through the inclusion of scenarios and also to give the referees scenarios associated with the home advantage which provided a choice of response. 171 county level referees from across the UK completed the online survey in addition to small sample (n=11) of elite Premier League referees, with access granted by the Professional Game Match Officials Limited (PGMOL).. The data collection method differed slightly to the previous referee study in that the elite referees completed paper and pencil versions of the same questionnaire, which were distributed at a training session by the sports psychology consultant. There were no significant differences observed between premier and county referees. However, there was a significant overall illusory superiority effect for the referees irrespective of referee level. Pearson correlations revealed a significant relationship between age and superiority and also between years as an official and superiority.

County referees indicated that they were far less influenced by external factors than their fellow county league referees and were content to apportion this bias to other referees at their level. The officiating scenarios also uncovered some interesting findings, with referees indicating that the referee would give decisions against the home team for factors such as players surrounding them, managers were giving them abuse and crowd booing. The only

decision that they would give in favour of the home team would be if the crowd shouted 'handball'. Although these scenarios provided some insight, they should also be viewed with some caution as when the 7 point Likert scale is considered the differences do seem relative as the full range of the Likert scale was not utilised. However, in contrast to the county level referees, Premier League referees saw themselves as no different to their fellow premier league referees in terms of being influenced by external factors. The refereeing scenarios also uncovered differences between the elite and county referees; these differences mainly occurred as a consequence of the elite referees consistently selecting the neutral point of 4.

9.8 Overall Conclusions of Referees' Perceptions of their Role in the Home Advantage

The study focussing on the referees' perceptions have revealed that county referees are much more willing to admit that they are influenced less than fellow referees at their level. In addition, and although differences were relative, they also indicated that they were more likely than elite referees to give decisions against the home team if surrounded by home players, verbally abused by the manager and booed by the home fans. Elite referees were far more guarded and refused to indicate any influence either upon themselves or on their fellow elite referees. The one issue on which both levels of referee reached a consensus was with regards to superiority. Total calculated superiority scores revealed that both levels of referees saw themselves as superior to their fellow referees, scoring themselves higher on positive items and lower on negative items. The present results support what has been previously discovered by Wolfson and Neave (2007) who also reported this superiority effect. The present study failed to unearth findings related to referee bias and on the whole elite referees remained more defensive surrounding the issue. The elite referees also failed to distinguish any differences in influence between themselves and others, whereas county levels referees saw themselves as far less influenced than other referees operating at their level. This distinction between the referees highlights the pressures to which elite referees are increasingly subjected. They are faced with intense criticism from players, managers and

fans, and a growing amount of media coverage has been dedicated of late to referees and possible mistakes that they have made.

9.9 Points of View: Players', Referees' and Fans' Perceptions of the Home Advantage in Football

Football personnel including players, managers and referees were individually studied in previous chapters. This study aimed to gain comparisons of such groups, however, football managers were replaced with football fans. It was envisaged that football fans would provide a different insight to the home advantage and possibly add another dimension to the research, thus creating a more holistic viewpoint of the home advantage. Sports fans in general have been frequently studied in relation to team identification, and one study also existed on football fans perceptions of the home advantage (Wolfson, Wakelin & Lewis, 2005). The present sample consisted of 373 participants comprising 94 players, 163 referees and 116 football fans. Results revealed similarities in the perceptions of the fans and players, while significant differences occurred between them and the responses attributed by the referees. All three groups identified the crowd and familiarity as the major reasons for the home advantage. The discrepancies occurred with items pertaining to the referees, who scored these factors much lower than the players and fans. There were some minor statistical issues with this study caused by unequal sample sizes; this was rectified via performing extra non-parametric tests to support the original conclusions of the MANOVA. As a collective group fans, players and managers identified crowd and familiarity as the major factors as to why teams perform better at home than they do away. This is also consistent with previous literature (Bray & Widmeyer, 2002; Wolfson, Wakelin & Lewis, 2005).

9.10 Overall Conclusions

The studies conducted in this thesis have demonstrated that the home advantage is a complex phenomenon which encompasses many factors within it. Courneya and Carron's (1992) findings prompted the authors to ask the 'what', 'when' and 'why' of the home advantage. The 'what' was stated as having the most extensive background in terms of statistical evidence and the authors asserted that this was not a priority for future research. Additionally, the 'when' question pertained to crowd size and travel and aimed to assess the degree to which performance outcomes vary for home and away teams. The 'why' aspect of the home advantage was considered as the most pertinent factor and would be instrumental in furthering understanding of the causes of the home advantage. The suggestions posited by the authors provided a range of valuable hypotheses and a rationale for subsequent home advantage studies which followed.

The current work has highlighted the importance of the role that hormones contribute to playing venue and the hormonal responses that emerge with playing at home and away. This work contributes to the understanding of why teams and players may perform better at home. The current findings provide support for the inclusion of hormones to explore playing performance at home and away, whilst partially supporting the territorial response to venue. The current findings also highlight the important inclusion of cortisol when measuring the home advantage providing strong evidence that individuals stress levels are significantly higher at home, and how a home venue can activate the HPA axis. This provides a possible explanation for teams and individuals who experience decreased performance at home. It also highlights the increased pressures that individuals and teams feel when performing in their home environment especially in front of a large vociferous crowd.

Courneya and Carron's (1992) 'when' part of the home advantage can be explained from the perceptual data obtained in this thesis. From combining this hormonal explanation and perceptual viewpoints a greater understanding of the home advantage phenomenon can be obtained. Attaining the perceptions of the key groups in football gives a unique insight

into how the home advantage is viewed. Prior to this a paucity of research has focussed on perceptions of the home advantage and those studies which have only utilised one particular group. From ascertaining referees, managers, players and fans perceptions a more holistic view has been generated. One of the most important factors to emerge from the studies was with regards to the manager and player interviews regarding the territorial and physiological responses to playing venue. Both groups identified that they felt territorial over their home ground and that they felt a sense of ownership over the pitch and stadium. In addition both groups also reported to experiencing physiological factors such as butterflies and used terminology such as adrenalin to describe such feelings. No other research study has previously reported this. The current research on perceptions can be used to enhance future research design and it is also envisaged that this could provide almost a preliminary self-help guide for those involved in the competitive game.

The home advantage is still a complex phenomenon, and the work in this thesis could provide an insight into additional mechanisms for exploration such as the issues of control and experience which emerged from the interviews. The work in this thesis also exposes the simplicity of previous home advantage models such as Pollard and Pollard's (2005b) original conceptualisation. Their conceptualisation provides an overview of the known factors which are encompassed within the home advantage. However, it does not account for some of the additional inter-relationships which have been found to exist, and also does not describe the impact of each variable contained within nor the exact roles which impact within them. Thus, from reviewing the literature in this thesis and the subsequent studies which have been conducted experimentally a new framework will be proposed in Chapter 10.

Chapter 10

Proposing the New Home Advantage Framework

“Some people are on the pitch, they think it’s all over! It is now!”

Kenneth Wolstenholme

Chapter 10: Proposing the New Home Advantage Framework

10.1 Explaining the Home Advantage in Football: Reviewing Existing Models

The results obtained regarding hormones and perceptions in this thesis lend support to the development of a new framework of the home advantage which specifically pertains to football. Pollard (2008) suggested that despite 25 years of research in this area, the exact causes of the home advantage are still relatively unknown. Two conceptualisations of the home advantage have been previously outlined, one providing a more generalised overview applicable to all sports which has been outlined in Chapter 1 and is termed the ‘framework for game location’ model (Courneya & Carron, 1992). The second conceptualisation pertains specifically to the home advantage in football and is referred to as the ‘inter-relationship of causes of the home advantage’; and this conceptualisation has been outlined in Chapter 6 (Pollard & Pollard, 2005b).

Courneya and Carron’s (1992) proposed framework for game location research incorporates five components consisting of game location (home, away); game location factors (crowd, learning, travel, rules); critical psychological states (competitors, coaches, officials); critical behavioural states (competitors, coaches, officials) and performance outcomes (primary, secondary, tertiary). These were believed to be the factors upon which home advantage should be based. The authors further stated that some of these factors simply required clarification whereas others had been ignored.

Pollard and Pollard (2005b) later provided a tentative attempt at composing a conceptualisation to explain the inter-relationships of the home advantage in football. It consisted of previously determined factors which have been identified from various research studies and included travel, crowd support, referee bias, familiarity, territoriality, tactics and psychological factors. They did, however, state that more research was required to isolate and quantify these factors and identify how they interact with one another. However, the conceptualisation provides a rather simplistic view of the home advantage in that it only

accounts for previous research and not the beliefs of sports personnel. The qualitative research in Chapter 6 with players and managers demonstrates that a far more complex inter-relationship exists among these factors. In addition, the explanations offered in Pollard and Pollard's conceptualisation requires further explanation to determine the constituents of the individual components. Moreover, the addition of two factors that arose from the interview, control and experience provide a rationale for the construction of a new framework (See Figure 10.1).

10.2 Explaining the Home Advantage in Football: Proposing a New Framework

The new home advantage framework proposed within this chapter has been composed with regards to previous literature combined with the experimental findings in this thesis. It is entitled the Football and Venue Effect (FAVE) framework. The FAVE framework includes the six factors which have been previously identified in Pollard and Pollard's (2005b) conceptualisation with some minor title adjustments. There are also three overlying factors which are envisaged to affect all of the central factors. Each of these factors will be discussed in turn below.

10.2.1 Overlying Factors: Psychological, Experience and Control

Pollard (2008) in his recent review of the home advantage in football identified that the belief systems which exist in players and managers who are aware of the home advantage could be a result of augmentation, thus resulting in a self-perpetuating phenomenon. The qualitative interviews study (Chapter 6) conducted with managers and players aimed to examine their home advantage beliefs. Interestingly, three factors were consistently alluded to: psychological factors, experience and control. The three factors are envisaged to be applicable to all of the central factors in Pollard and Pollard's (2005b) conceptualisation and hence they are positioned hierarchically above in the revised framework. Players and

managers consistently referred to being in control of processes such as their preparation but also having to relinquish control over aspects such as the referee and crowd. The exact effect of this control factor, whether positive or negative, requires further investigation. Experience was also alluded to throughout the interviews, where players and managers stated they drew upon previous experience playing at home or away to combat any negative factors which may have emerged, including crowd stressors. They also suggested that it was the younger players who would succumb to these types of stressors because they were lacking in experience. Pain and Harwood (2007) also noted this as a factor in their qualitative research on football and performance factors. Players in their study suggested that if they knew what to expect then they could cope better as a result, although they did not make reference to age. Finally, a prominent focus on psychological factors, although not always referred to by name, was an underlying theme throughout the interviews. Players and managers reported that they knew of certain aspects such as weather elements which could psychologically interrupt a visiting player's performance before the game commenced; they also suggested that player character was important and referred to 'homers' in reference to players who only liked to play at home and not away. In addition, they commented on external pressures such as the media which could potentially affect people's perceptions of the game, giving examples pertaining to the referee as an illustration.

A combination of these factors lends support to the complex belief systems that operate within the home advantage. Managers and players are in the best position to determine these exact beliefs having experienced these factors first hand. The identification of the two new additional factors may also give a valuable insight into the home advantage.

10.2.2 Travel Factors

The evidence pertaining to the issue of travel remains equivocal, where Pollard (2008) in particular has emphasised that the effects of travel on away teams are inconclusive. Schwartz and Barsky (1977) suggested that travelling to venues led to an inevitable

disruption in routine, sleep pattern and food but they did not provide data to support this. When statistical evidence has been sought, it has not always provided consistent support for travel explanations. Indeed, Pollard (1986) reported no differences in travel effects between teams more than or less than 200 miles. However, previous to this Snyder and Purdy (1985) did report a travel effect, indicating a greater home advantage when teams had to travel over 200 miles and a declining advantage when the opposition travelled 175 miles or less. The most pertinent aspects to emerge from the interview data concerned routine disruption and mode of travel; players and managers reported that they preferred to travel by plane than coach and a day before the game rather than on game day. These factors further relate to Pollard and Pollard's (2005) supposition that the home advantage decline could be as a result of travel being easier and more comfortable. In terms of the inter-relationships evident within the FAVE framework, travel factors affect the crowd due to having to get transport to games and also for most teams the number of fans that are able to attend the game is significantly reduced away from home. Travel is also linked to the overlying factors of experience, control and psychological factors.

10.2.3 Referee Factors

A growing literature base exists on the impact of the referee on the home advantage. Experimental work conducted in Chapters 7 and 8 has revealed that referees tend to externalise their perceptions of the home advantage. The referees have further indicated that they do not play a role within it. In addition, they believe they are superior to their fellow referees, and county referees have revealed that they are less influenced than other referees who operate at their level. Nevill et al. (2002) provided one of the most rigorous experimental studies pertaining to football referees and reported that those who were exposed to crowd noise awarded more decisions in favour of the home team and were close in agreement with the original referee's decision than those who watched the same incidents without sound. Those who were in the no noise condition displayed more certainty with their decision

making, awarded a greater number of fouls against the home players, and chose more no foul options. Interestingly, Dohmen (2005) created some controversy when he indicated that football referees in Germany were influenced by crowd preferences. His data revealed that referees lengthened exciting games in favour of the home team and allowed more added on time to games when the home team were behind by one goal. These findings are represented by a two-way arrow between crowd and referee in the FAVE framework highlighting this apparent reciprocal relationship.

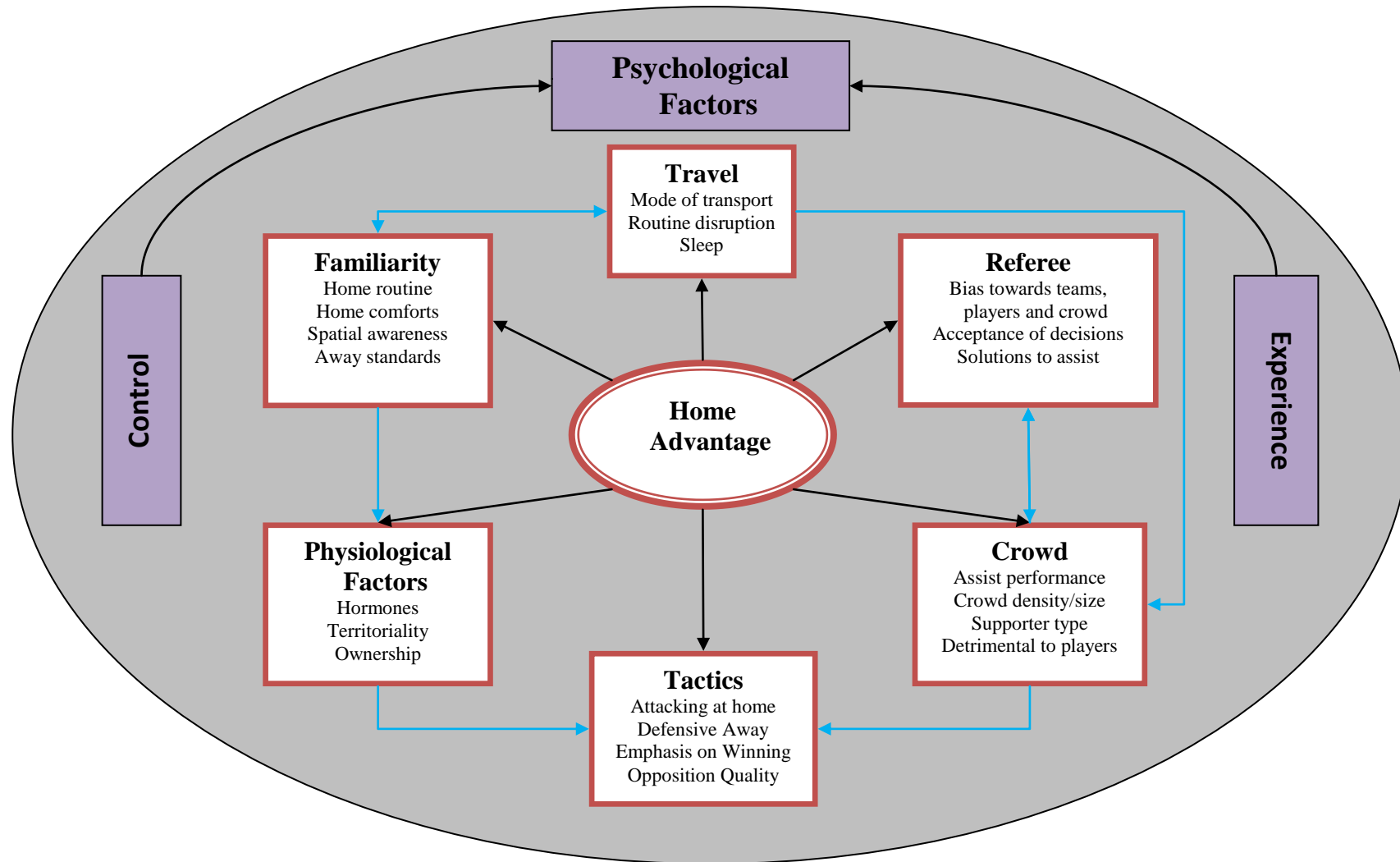


Figure 10.1: Football and Venue Effect (FAVE) Framework

10.2.4 Crowd Factors

Following on from the crowd influencing the referee and the apparent reciprocal relationship between the two, it is important to outline the full effects that the crowd have on the home advantage. In Chapter 6 managers and players indicated that the home crowd could help improve a player's performance. However, they also stated that the home crowd could be detrimental to their performance. A vast amount of research has been conducted on the impact of the crowd on the home advantage, with findings such as the volume of crowd having an effect (Agnew & Carron; Schwartz & Barsky, 1977). Thirer and Rampey (1979) focussed on the antisocial behaviour of a basketball crowd and noted that during normal crowd behaviour visiting teams committed more fouls and during antisocial behaviour the home team committed more fouls. This has been extended by the findings of Baumeister and Steinhilber (1984) who found from baseball and basketball archival data that there was tendency for teams to perform worse at home, especially when in a final or in a critical decisive match at home. They termed this "choking" under pressure suggested it resulted due to an increased awareness from the home players that they were being watched by an increasingly agitated audience. Relating back to the FAVE framework the issue of the crowd again is overseen by the overlying factors of experience, control and psychological factors. The crowd factor also pertains to the players, managers and referees, the complex inter-relationships are highlighted with arrows in FAVE framework.

10.2.5 Tactics

This factor has received little attention and is based largely on anecdotal evidence. Pollard and Pollard's (2005b) review noted that teams playing away from home adopted a more defensive style of play. The authors did however, provide some statistical evidence to support this assertion and reported that knock-out stages of the European Cup depend upon total goals home and away, resulting in a greater home advantage. Players and managers in Chapter 6 reported that they felt that they attacked more at home and were more defensive away from home, although they did state that this was also dependent on the opposition. In addition, and with specific regard to the

managers, they did also state that an overall emphasis was placed on winning at home and away irrespective of performance.

10.2.6 Physiological Factors

As has been previously stipulated throughout this thesis and shown throughout experimental studies there is a clear need for physiological factors to be included in a framework for the home advantage. Neave and Wolfson (2003) provided the first insight that a hormonal response to venue was evident and found that testosterone levels in football players were significantly higher at home opposed to away. This was then expanded upon by Carré et al., (2006) in ice hockey players who also reported that testosterone levels were significantly higher at home. The authors also reported that pre-game cortisol levels were higher at home. In the proposed framework this hormonal effect has been termed ‘physiological factors’, which also includes territoriality and feelings of ownership. In the conducted interviews in Chapter 6 both players and managers alluded to physiological changes such as the adrenalin ‘surge’ or ‘rush’, and they also indicated feelings of ‘butterflies’ which is the lay person term for the release of epinephrine or adrenalin. By terming this factor as physiological, all of these colloquial terms and the experimental findings pertaining to testosterone and cortisol in the present thesis are encompassed. In addition the term also covers the feelings of territoriality which also links to a hormonal response and ownership. Physiological factors also have an inter-relationship with tactics as more pronounced hormonal responses have been found at home than away and this could be related to tactical differences in relation to players working harder at home. The physiological factor is also envisaged to be overseen by control, experience and psychological factors. The physiological responses associated with playing venue could be due to the length of time that a player has spent at one particular club.

10.2.7 Familiarity

Familiarity has undoubtedly been identified as one of the major contributors to the home advantage. Indeed in Chapter 6 players and managers both indicated that this was one of the most pertinent factors, and players, fans and referees in Chapter 8 also supported this. Gayton, Broida and Elgee (2001) also provided support for this perceptual finding in coaches who stipulated that site familiarity was the major contributor. Courneya and Carron (1992) have indicated that exploring the notion of familiarity could be somewhat problematic, and as a consequence few studies exist. One way familiarity has been researched in the past has focussed on artificial pitches, where an inflated home advantage was found for teams who played on them compared with teams who did not (Barnett & Hilditch, 1993; Clarke & Norman, 1995). Pollard (2002) has also reported that a team's home advantage becomes reduced in the first season they move to a new stadium. This has been explained by Pollard and Pollard (2005b) as possibly due to familiarity of alignment and size of pitch and visual cues that a player uses in a game such as score boards and pre-match preparation. In the interviews reported in Chapter 6 players and managers indicated that they liked familiar surroundings and having a set routine which would be disrupted away from home. They also admitted to liking the convenience aspect of playing at home, where if they had forgotten anything or wanted anything extra they could easily obtain it. In addition, they also reported the benefits of seeing familiar faces on game day and having their own allocated car parking space. The issue of familiarity is one which requires further investigation; although frequently cited as the major contributor of the home advantage, little empirical evidence exists to support this.

10.3 Overall Conclusions and Future Research

The current research outlined in this thesis provides strong support for the establishment of a new model of the home advantage. Courneya and Carron (1992) and Pollard and Pollard (2005b) have provided some attempt to address the home advantage causes and have composed their own framework and conceptualisation. A comprehensive home advantage framework is

required to inform present and future home advantage researchers with an indication of the factors and inter-relationships which exist within this complex phenomenon. The FAVE framework proposed in this chapter provides a basis from which future models could be derived, and it may also provide an initial insight into these complex factors in relation to other sports. The present framework could also be utilised to inform the forthcoming London 2012 Olympic Games and assist athlete and coach preparation. From understanding the factors identified in the model athletes and coaches could potentially utilise the findings to maximise performance, for example, training at Olympic venues to gain venue familiarity. As a consequence of this an athlete may feel more territorial over the environment which could evoke a strong protective response with an associated positive endocrine change (e.g. increased testosterone, decreased cortisol).

The present thesis also provides support for the use of qualitative methods in investigations of the home advantage, as utilising interviews allowed players and managers to expand on their perceptions, thus, advancing and giving substance to previously identified factors. By conducting further qualitative research, greater insight can be gained on the effects of the home advantage to firstly corroborate the findings in this thesis and also to expand the findings to other sports and look for similarities and differences.

The results obtained regarding hormones outlined in Chapters 3, 4 and 5 also provide further evidence for complex relationships between venue and hormones, indicating further research is required to determine the effects of these hormones. This may be particularly true of the role of testosterone, as the results found in this thesis do not fully support the work of Neave and Wolfson (2003). Although research conducted thus far has tended to focus on testosterone and cortisol, other hormones may need to be accounted for such as adrenalin, which was alluded to in the interviews. There could therefore be a more complex hormonal system or inter-relationship evident in relation to playing venue; this could also be sports specific.

By adopting a triangulated research approach, it is clear that a more comprehensive overview of the home advantage has been found. From combining hormonal and perceptual findings a greater insight has been provided into the mechanisms that comprise the home advantage. Although a model has been subsequently generated from triangulated methods, the

next step in this research domain is to authenticate, generate hypotheses from and further test the factors contained within the framework. This should occur in football and in other sports.

Future research exploring possible hormonal changes in relation to venue may want to consider using more robust measures to explore possible behavioural relationships. Questionnaires should incorporate more accurate measure psychological concepts such as stress, anxiety, dominance and aggression in order to establish a hormone-behaviour relationship. In addition single-subject design could also be employed to study an individual over a longer period of time; this would assist in determining a complete hormonal performance profile. From addressing these issues a more detailed understanding can be sought into the hormone-behaviour relationship and which psychological variables impact upon it.

Although a comprehensive overview has been attempted, the understanding of this phenomenon is by no means complete. While this thesis provides a significant step in explaining some of the better known concepts, it also identifies new emergent concepts which may further add to the complexity of the framework.

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Appendices

APPENDIX A

Manager and Fitness Coach Player Rating Questionnaire



Today's ratings for _____

Anything unusual (eg different position, back after injury or illness) please put overleaf.

Mental State (please circle)

	Not at all						Extremely
Aggression	1	2	3	4	5	6	7
Confidence	1	2	3	4	5	6	7
Focus	1	2	3	4	5	6	7
Positive attitude	1	2	3	4	5	6	7
Awareness	1	2	3	4	5	6	7
Self-control	1	2	3	4	5	6	7
Followed game plan	1	2	3	4	5	6	7
Motivated other players	1	2	3	4	5	6	7

Performance (please circle)

Performance (praise only)							
	Poor				Excellent		
Work rate	1	2	3	4	5	6	7
Game contribution	1	2	3	4	5	6	7
Teamwork	1	2	3	4	5	6	7
Creativity	1	2	3	4	5	6	7
Ball distribution	1	2	3	4	5	6	7
OUTFIELD ONLY:							
Tackling	1	2	3	4	5	6	7
Shooting	1	2	3	4	5	6	7
Passing	1	2	3	4	5	6	7
Defending							
GOALKEEPER ONLY:							
Catching	1	2	3	4	5	6	7
Handling	1	2	3	4	5	6	7
Kicking	1	2	3	4	5	6	7
Positioning	1	2	3	4	5	6	7

Compared to his usual self how did he play today overall?

	Worse than usual			Same as usual		Better than usual	
Mental State	1	2	3	4	5	6	7
Performance	1	2	3	4	5	6	7

APPENDIX B

Marteau and Bekker's (1992) STAI-6 Questionnaire

Marteau, TM. & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology*. 31, 301-306

SF State Anxiety

A number of statements which people have used to describe themselves are given below.

Read each statement and then circle the most appropriate number to the right of the statement to indicate how you feel right now, at this moment.

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately	Very much
1	I feel calm	1	2	3	4
2	I feel tense	1	2	3	4
3	I am upset	1	2	3	4
4	I feel relaxed	1	2	3	4
5	I feel content	1	2	3	4
6	I am worried	1	2	3	4

APPENDIX C

Qualitative Interview Schedule



I'm going to be asking some questions about your overall experiences playing at home and away, so please feel free to talk about your time as a player and as a manager. I'm sure you're aware that in general teams do better at home than away. What are your personal views on why that's the case?

Thinking about a playing venue that is pertinent to you, what did you most like about playing at home? Least?

What about playing away, how did your experience differ? What did you like/dislike?

Again thinking about the same venue as before what were your impressions of your stadium?

- do you feel any affinity towards it or a sense of ownership of it?
- if so, when did that begin (as soon as you joined, or somewhat later?)

In terms of pre-match preparation does it differ when playing home and away? How? (anxious/nervous, travel etc)

What were your feelings prior to a home v away game?

- atmosphere in the changing room
- walking out on to the pitch

How did it feel when you won/lost a game?

The crowd are known to have a big impact upon football games, how did your fans contribute to your playing experiences? Were there any differences home and away?

We've talked about your fans what about the other teams' fans; did they affect you at all? (provoke, distract etc)

Referees are also an integral part of a playing experience, do you feel that they can influence a game and how?

Which playing position do you feel is under the most pressure within a game?

APPENDIX D

County and Elite Football Referees Home Advantage Perception Questionnaire



Section 1: About you

Gender	Male / Female (please circle)
Age	
Main occupation before you became an official	
How long (in years) have you been an official?	
In which league(s) do you currently officiate?	
Approximately how many games per month do you officiate as main match official?	
Approximately how many games per month do you officiate as assistant?	

Section 2: Your opinion

<p>At which ground do you prefer to officiate, and why?</p> <p>At which ground do you least prefer to officiate, and why?</p> <p>Which stadium has the best facilities for officials and why?</p>

Section 3: When you are the main match official, to what extent do you feel the following during the match? Please compare yourself to other officials operating at your level.

	Less than other officials			Same as other officials			More than other officials
Assertive	1	2	3	4	5	6	7
Anxious	1	2	3	4	5	6	7
Under pressure	1	2	3	4	5	6	7
Confident	1	2	3	4	5	6	7
Apprehensive	1	2	3	4	5	6	7
Decisive	1	2	3	4	5	6	7
Positive	1	2	3	4	5	6	7
In control	1	2	3	4	5	6	7
Confident in your assistants	1	2	3	4	5	6	7
Well prepared	1	2	3	4	5	6	7

Section 4: When I am the main match official, I think that I am:

	Not at all					Extremely	
Influenced by the home crowd	1	2	3	4	5	6	7
Influenced by the managers and coaching staff	1	2	3	4	5	6	7
Biased towards the home team	1	2	3	4	5	6	7
Influenced by the number of bookings already made in the match	1	2	3	4	5	6	7
Concerned about making key decisions that would have a big impact on the game	1	2	3	4	5	6	7
Influenced by how the home crowd have responded to previous decisions that I have made	1	2	3	4	5	6	7
Confident that my assistants can remain objective	1	2	3	4	5	6	7

Section 5: When a typical official operating at my level is refereeing a match I think that they are:

	Not at all				Extremely		
Influenced by the home crowd	1	2	3	4	5	6	7
Influenced by the managers and coaching staff	1	2	3	4	5	6	7
Biased towards the home team	1	2	3	4	5	6	7
Influenced by the number of bookings already made in the match	1	2	3	4	5	6	7
Concerned about making key decisions that would have a big impact on the game	1	2	3	4	5	6	7
Influenced by how the home crowd have responded to previous decisions that I have made	1	2	3	4	5	6	7
Confident that their assistants can remain objective	1	2	3	4	5	6	7

Section 6: Officiating scenarios

Please imagine that you are officiating at a game where the following have occurred, and rate how each one might influence your decisions during the game.

	In favour of away team			Not at all	In favour of home team		
The home crowd are booing a decision that I have just made	1	2	3	4	5	6	7
The majority of the home crowd have shouted "handball" before I have made a decision	1	2	3	4	5	6	7
The home manager is verbally expressing anger towards me	1	2	3	4	5	6	7
The home players are surrounding me and questioning a decision I have just made	1	2	3	4	5	6	7

Thank you very much! If you have any further opinions about the effect of the venue, please feel free to indicate them below or anywhere else on this questionnaire.

APPENDIX E

Player, Fan and Referee Home Advantage Perception Questionnaire



	Not at all					Extremely	
The home crowd energises and motivates the players	1	2	3	4	5	6	7
The home players are more familiar with the environment	1	2	3	4	5	6	7
The home crowd intimidate the officials	1	2	3	4	5	6	7
The away players are more likely to commit fouls so are booked more	1	2	3	4	5	6	7
The away players have had to travel	1	2	3	4	5	6	7
The home crowd provide information to the officials about what has happened, as in “Handball”	1	2	3	4	5	6	7
The home players feel more protective over their territory	1	2	3	4	5	6	7
The officials want to manipulate the home crowd	1	2	3	4	5	6	7
The home players are calmer and more controlled than the away team so commit fewer infringements	1	2	3	4	5	6	7
The officials are reluctant to call a foul or penalty against the home team	1	2	3	4	5	6	7

